Permit Rationale

Date: November 29, 2016

Permit Writer: Ryan Olive

Facility Name: Cedar Rapids, City of STP

Location: County: Linn
Latitude: 41 degrees 57 minutes 33 seconds
Longitude: 91 degrees 33 minutes 53 seconds

Region/ FO: **DNR FO#**1, Manchester

Design: Discharge to Cedar River (A1, B(WW-1) HH)

Date Constructed: 2008
Flow: ADW: 43.7700 MGD; AWW: 56.0000 MGD; MWW: 86.9500 MGD
BOD5 406,000.00 lbs./day: TKN 18,500.00 lbs./day
P.E. 2,431,137

Sources: Construction Permit 95-133-S dated 3/16/1995 & Schedule G dated 10/4/1994

Treatment Plant Description: Wastewater treatment is provided by an activated sludge wastewater treatment plant. The treatment facility consists of three primary clarifiers, roughing filters, anaerobic pretreatment (consists of a Biothane UASB process), liquid oxygen generation, Zimpro LPO treatment, one carbonaceous activated sludge basin, one nitrification activated sludge basin, four CAS clarifiers and four NAS clarifiers. Disinfection of the effluent is provided by two chlorine disinfection units with magnesium biosulfite dechlorination. Sludge is handled with two dissolved air flotation units, three gravity belt thickeners, two belt presses, two centrifuges and an incinerator. The facility accepts domestic waste from the City of Cedar Rapids. The facility also has a pretreatment program and pretreatment coordinator to organize and manage industrial waste coming into the facility.

Outfalls: The facility has the option to discharge treated effluent from three different outfall scenarios.
Outfall 001: Diffuser discharge when the Cedar River flow at upstream USGS gage is less than 12,900 cfs
Outfall 004: Shoreline discharge when the Cedar River flow at upstream USGS gage is less than 12,900 cfs
Outfall 117: Combined discharge from the diffuser and shoreline structure when the Cedar River flow at upstream USGS gage is greater than 12,900 cfs

Wasteload allocation: WLA's dated May 27, 2016 & September 9, 2008

Antidegradation: A tier II antidegradation would typically be required, however the only factor that triggers the antidegradation review is the less stringent limits for several parameters for all three outfall

scenarios. The more stringent limits between the May 27, 2016 & September 9, 2008 WLA's were used in the renewal NPDES permit, thus tier II antidegradation review is not necessary.

Impaired Waterbody: The following stream segments in the discharge route are on the 2014 impaired waters list:

- The Cedar River for primary contact – indicator bacteria, aquatic life – biological (mussels), primary contact and aquatic life – pH
- The Iowa River for primary contact – indicator bacteria
- The Mississippi River for aquatic life – aluminum

A TMDL was completed for the Cedar River for *E. coli* in 2010. This facility was assigned limits of a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th.

TMDLs for the other impaired segments in the route of flow downstream from this facility have not been completed. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations.

Limits: Outfall 001 – Diffuser Discharge

Effective from permit issuance to permit expiration

Parameter	Season	7-day ave **mg/L**	30-day ave **mg/L**	daily max **mg/L**	min	max	7-day ave **lbs/day**	30-day ave **lbs/day**	daily max **lbs/day**
$CBOD_5$	yearly	---	113	277	---	---	---	---	---
$CBOD_5$ (lbs/cfs/day)	yearly	---	---	---	---	---	---	20	20
TSS	yearly	---	120	200	---	---	---	56,045	93,048
pH	yearly	---	---	---	6.0	9.0	---	---	---
DO (mg/L)	yearly	---	---	---	1.7	---	---	---	---
NH3N (lbs/cfs/day)	January	---	---	---	---	---	---	11.5	16.3
NH3N (lbs/cfs/day)	February	---	---	---	---	---	---	11.5	16.3
NH3N (lbs/cfs/day)	March	---	---	---	---	---	---	4.5	6.4
NH3N (lbs/cfs/day)	April	---	---	---	---	---	---	4.5	6.4
NH3N (lbs/cfs/day)	May	---	---	---	---	---	---	4.5	6.4
NH3N (lbs/cfs/day)	June	---	---	---	---	---	---	3.6	6.4

NH3N (lbs/cfs/day)	July	---	---	---	---	---	---	4.6	7.7
NH3N (lbs/cfs/day)	August	---	---	---	---	---	---	4.1	7.7
NH3N (lbs/cfs/day)	September	---	---	---	---	---	---	4.2	6.4
NH3N (lbs/cfs/day)	October	---	---	---	---	---	---	4.5	6.4
NH3N (lbs/cfs/day)	November	---	---	---	---	---	---	4.5	6.4
NH3N (lbs/cfs/day)	December	---	---	---	---	---	---	4.5	6.4
TRC	yearly	---	0.1	0.15	---	---	---	48	68
Cadmium	yearly	---	0.001	0.010	---	---	---	0.646	4.6
Copper	yearly	---	0.030	0.049	---	---	---	14.1	22.9
Cyanide	yearly	---	0.027689	0.1047	---	---	---	12.93	48.88
Selenium	yearly	---	0.026	0.088	---	---	---	12.0	41.3
Zinc	yearly	---	0.550	0.550	---	---	---	257	257
E. coli (Geomean)	summer (March-Nov)	---	---	126	---	---	---	---	---

Limits: Outfall 004 – Shoreline Discharge

Effective from permit issuance to permit expiration

Parameter	Season	7-day ave **mg/L**	30-day ave **mg/L**	daily max **mg/L**	min	max	7-day ave **lbs/day**	30-day ave **lbs/day**	daily max **lbs/day**
$CBOD_5$	yearly	---	113	277	---	---	---	---	---
$CBOD_5$ (lbs/cfs/day)	yearly	---	---	---	---	---	---	20	20
TSS	yearly	---	120	200	---	---	---	56,045	93,048
pH	yearly	---	---	---	6.0	9.0	---	---	---
DO (mg/L)	yearly	---	---	---	1.6	---	---	---	---
NH3N (lbs/cfs/day)	January	---	---	---	---	---	---	1.9	1.9

NH3N (lbs/cfs/day)	February	---	---	---	---	---	---	1.8	1.8
NH3N (lbs/cfs/day)	March	---	---	---	---	---	---	1.9	1.9
NH3N (lbs/cfs/day)	April	---	---	---	---	---	---	1.9	1.9
NH3N (lbs/cfs/day)	May	---	---	---	---	---	---	1.8	1.9
NH3N (lbs/cfs/day)	June	---	---	---	---	---	---	1.1	1.8
NH3N (lbs/cfs/day)	July	---	---	---	---	---	---	1.4	2.2
NH3N (lbs/cfs/day)	August	---	---	---	---	---	---	1.3	2.1
NH3N (lbs/cfs/day)	September	---	---	---	---	---	---	1.3	2.1
NH3N (lbs/cfs/day)	October	---	---	---	---	---	---	2.0	2.0
NH3N (lbs/cfs/day)	November	---	---	---	---	---	---	1.8	1.8
NH3N (lbs/cfs/day)	December	---	---	---	---	---	---	2.0	2.0
TRC	yearly	---	0.222	0.32	---	---	---	103.7	150
Chloride	yearly	---	699	699	---	---	---	326,318	326,318
Cadmium	yearly	---	0.001	0.002	---	---	---	0.290	1.11
Copper	yearly	---	0.015	0.015	---	---	---	7.05	7.05
Cyanide	yearly	---	0.012	0.02458	---	---	---	5.56	11.4
Selenium	yearly	---	0.011	0.02157	---	---	---	5.34	10.0
Silver	yearly	---	0.004	0.004	---	---	---	1.983	1.983
Zinc	yearly	---	0.133	0.133	---	---	---	62	62
E. coli (Geomean)	summer (March-Nov)	---	---	126	---	---	---	---	---

Limits: Outfall 117 – Combined Diffuser & Shoreline Discharge

Effective from permit issuance to permit expiration

Parameter	Season	7-day ave **mg/L**	30-day ave **mg/L**	daily max **mg/L**	min	max	7-day ave **lbs/day**	30-day ave **lbs/day**	daily max **lbs/day**
$CBOD_5$	yearly	---	113	277	---	---	---	---	---
$CBOD_5$ (lbs/cfs/day)	yearly	---	---	---	---	---	---	---	---
TSS	yearly	---	120	200	---	---	---	56,045	93,048
pH	yearly	---	---	---	6.0	9.0	---	---	---
NH3N (lbs/cfs/day)	January	---	---	---	---	---	---	1.7	1.7
NH3N (lbs/cfs/day)	February	---	---	---	---	---	---	1.9	1.9
NH3N (lbs/cfs/day)	March	---	---	---	---	---	---	1.5	1.5
NH3N (lbs/cfs/day)	April	---	---	---	---	---	---	1.2	1.2
NH3N (lbs/cfs/day)	May	---	---	---	---	---	---	1.2	1.2
NH3N (lbs/cfs/day)	June	---	---	---	---	---	---	1.2	1.2
NH3N (lbs/cfs/day)	July	---	---	---	---	---	---	1.3	1.3
NH3N (lbs/cfs/day)	August	---	---	---	---	---	---	1.1	1.1
NH3N (lbs/cfs/day)	September	---	---	---	---	---	---	1.4	1.4
NH3N (lbs/cfs/day)	October	---	---	---	---	---	---	1.4	1.4
NH3N (lbs/cfs/day)	November	---	---	---	---	---	---	1.2	1.2
NH3N (lbs/cfs/day)	December	---	---	---	---	---	---	1.4	1.4
TRC	yearly	---	0.1	0.15	---	---	---	48	68
Copper	yearly	---	0.03	0.049	---	---	---	14.1	22.9
E. coli (Geomean)	summer (March-	---	---	126	---	---	---	---	---

	Nov)								

Basis for limits :

$CBOD_5$ Concentration Limits for all outfalls : The $CBOD_5$ limits are a 30-day average and daily maximum rather than a 7-day average and 30-day average because the industrial adjustment uses the 30-day average and daily maximum parameters from 40 CFR for each industry.

$CBOD_5$ (lbs/cfs/day) outfall 001 & 004 : $CBOD_5$ lbs/cfs/day limits are included in addition to the concentration limits established by the industrial adjustment.

$CBOD_5$ (lbs/cfs/day) outfall 117 : At river flows at or above 13,500 cfs the $CBOD_5$ level of 277 mg/l governs over the flow-variable value of 20 lbs/cfs/day, thus no flow-variable limits mass limits are given to outfall 117.

TSS for all outfalls : The industrial adjustment allowed by 40 CFR 133.103(b) would provide the facility with less stringent limits, but due to the downstream impairment, the TSS limits calculated by the industrial adjustment will not be used. To avoid potential backsliding, the limits from the previous permit are used in this permit.

pH for all outfalls : Technology based pH limits govern those in the May 27, 2016 WLA.

NH3N (ammonia nitrogen) for all outfalls : Based on a review of the ammonia effluent data from the City, it is clear that the facility can comply with proposed ammonia limits outlined in this draft permit. This permit contains ammonia monitoring and limits that are effective at permit issuance. The limits comprising this permit come from the more stringent limit between those in the May 26, 2016 and the September 9, 2008 WLAs.

E. coli for all outfalls : A sample for E. coli was submitted with the application. The result was 820 org./100mL. The facility discharges into a Class (A1) water body. The water quality standard for *E. coli* in a Class (A1) water body is a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th. The criteria apply at "end-of-pipe". A TMDL was completed for the Cedar River for *E. coli* in 2010. This facility was assigned limits of a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th. These limits match the water quality based limits listed above. However, the recent chapter 62 revision that became effective on Oct. 14, 2009 states "…that the daily sample maximum criteria for *E. coli* set forth in Part E of the 'Supporting Document for Iowa Water Quality Management Plans' shall not be used as an end-of-pipe permit limitation." Therefore, only the geometric mean limit of 126 org./100 ml applies to this facility. While the *E. coli* result of 820 org./100mL is above the WLA limit, a review of the *E. coli* data submitted by the City shows that they are able to consistently meet the 126 org./100 ml geometric mean limit. The facility is equipped with a functional chlorine disinfection system that is used to disinfect the treated effluent and therefore the Cedar Rapids STP is able to comply with the geometric mean limits from the May 27, 2016 WLA upon permit issuance.

Chloride for outfalls 001 & 117 : A sample for chloride was submitted with the application. The chloride result of 705 mg/L was less than 50% of 30-day average limit for outfalls 001 & 117 calculated in the May 27, 2016 WLA. Therefore there is no reasonable potential for the discharge to violate the chloride WQS and no chloride limits have been proposed.

Chloride for outfall 004 : The chloride sample of 705 submitted with the application was higher than the 699 mg/l limit for outfall 004 calculated in the May 27, 2016 WLA. Monitoring and limits for chloride for outfall 004 will remain in the permit.

Sulfate for all outfalls : A sample for sulfate was submitted with the application. The sulfate result of 387 mg/L was less than 50% of 30-day average limit for all three outfall scenarios calculated in the May 27, 2016 WLA. Therefore there is no reasonable potential for the discharge to violate the sulfate WQS and no sulfate limits have been proposed.

TRC : Since the facility is equipped with a functional chlorine disinfection unit, TRC monitoring and limits are included in the permit. The TRC limits for outfall's 001, 004 & 117 come from the more stringent limits between the May 26, 2016 and the September 9, 2008 WLAs. Since the facility has the ability to disinfect the effluent on at any time of the year, TRC limits are now included on year round basis.

Metals outfall 001 : The previous permit required regular monitoring for cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver and zinc. A reasonable potential review was conducted using the past 4 years of monitoring data. The results showed that no reasonable potential for limit exceedance existed in chromium, lead, mercury, nickel and silver and the monitoring for these metals have been removed from this permit. The data review did show reasonable potential for cadmium, copper, cyanide, selenium and zinc. Due to reasonable potential existing for these metals, monitoring and limits will be included in this permit.

Metals outfall 004 : The previous permit required regular monitoring for cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver and zinc. A reasonable potential review was conducted using the past 4 years of monitoring data. The results showed that no reasonable potential for limit exceedance existed in chromium, lead, mercury and nickel and the monitoring for these metals have been removed from this permit. The data review did show reasonable potential for cadmium, copper, cyanide, selenium, silver and zinc. Due to reasonable potential existing for these metals, monitoring and limits will be included in this permit.

Metals outfall 117 : The previous permit required regular monitoring for cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver and zinc. A reasonable potential review was conducted using the past 4 years of monitoring data. The results showed that no reasonable potential for limit exceedance existed in cadmium, chromium, cyanide, lead, mercury, selenium, silver, nickel and zinc and the monitoring for these metals have been removed from this permit. The data review did show reasonable potential for copper. Due to reasonable potential existing for this metal, monitoring and limits will be included in this permit.

The City of Cedar Rapids STP was also required to test for dissolved oxygen (DO), nitrate + nitrite nitrogen, Total Kjeldahl Nitrogen (TKN), oil and grease, and phosphorus.

Dissolved Oxygen : Modeling conducted in the May 27, 2016 WLA determined that the effluent from the plant must maintain a minimum DO of 1.7 mg/L from outfall 001 and 1.6 mg/L from outfall 004 to ensure a minimum DO of 5.0 mg/L in stream for an allowed maximum effluent $CBOD_5$ of 40mg/L. The average result of the DO sample submitted with the permit application was 8.5 mg/L. Monitoring and limits are being included in the permit to ensure DO limits are met for outfalls 001 & 004. Modeling conducted in the May 27, 2016 WLA showed that ammonia nitrogen levels associated with discharge form outfall 117 will not cause DO levels to be below 5.0 mg/L at any time. No DO monitoring or limits are required for outfall 117.

Oil & Grease : The oil and grease sample submitted with the application was 0 mg/L. We only have a narrative standard for oil and grease. In most cases if oil and grease is below 10 mg/L, there should not be a visible sheen.

TKN, Nitrate + Nitrite Nitrogen and Total Phosphorous : The average phosphorus sample result was 6.37 mg/L. There are no Water Quality Standards (WQS) for phosphorus. The average nitrate + nitrite nitrogen sample result was 6.03 mg/L. The standard for nitrate applies only to Class "C" waters that are used for drinking water which the Cedar River is not. The average TKN sample result was 13.2 mg/L. There are no WQS for TKN. Based on information currently available the Department cannot make a reasonable potential determination for the narrative WQS in IAC 567-61.2(3) specific to nitrogen and/or phosphorus. However, monitoring for both total nitrogen and total phosphorus are included as part of the Iowa Nutrient Reduction Strategy.

Part B Pollutants : Although the detection levels for hexachlorobenzene in Part B were above the WQBELs, I see no potential for the discharge from the City of Cedar Rapids STP to result in a hexachlorobenzene WQS violation due to the fact that these chemicals have been banned in the United States.

All other parameters in Part B of the application either did not show any reasonable potential for limit exceedance or have limits and monitoring associated with the pollutant of concern.

Backsliding: The permit has been reviewed for anti-backsliding according to sections 303(d)(4) and 402(o) of the Clean Water Act and 40 CFR 122.44. All limits and conditions proposed in this permit are at least as stringent as those in the previous permit. Backsliding is not occurring.

Effluent Toxicity: Toxicity tests have not been conducted by US EPA Region VII. The Department is incorporating toxicity and limits testing into the permit as per revised Rule 567 IAC 63.4(455B) which became effective June 19, 1991. The dilution percentages for effluent toxicity testing specified in the May 27, 2016 WLA are 21.0% of effluent and 79.0% of dilution water. An annual monitoring frequency is specified in the permit.

Monitoring Basis: Compliance and operational monitoring are based on Chapter 63 IAC, Table II. Category > 105,000.

Special Monitoring: See pages 21 through 27 of the permit for the flow, bathymetric report, total nitrogen, ammonia nitrogen, metals and *E. coli* special monitoring language.

Sludge: Sludge will be land applied according to Chapter 567 IAC 67 land application rules, or otherwise disposed of in accordance with federal regulations specified in 40 CFR Part 503. No adverse environmental impacts have been identified.

Pretreatment: The City's Pretreatment Program was approved on October 29, 1984. The last inspection was completed by Carl Berg, DNR FO #2, on March 27, 2012.

This permit requires the City to evaluate the adequacy of its local limits to meet the general prohibitions against interference and pass through listed in 40 CFR 403.5(a) and the specific prohibitions listed in 40 CFR 403.5(b). The permit also requires an annual pretreatment report describing the pretreatment program activities of the previous year be submitted to the department by March 1st of each year. Additionally, The City shall evaluate the approved pretreatment program for compliance with 40 CFR 403 and Iowa Administrative Code 567 – Chapter 62.

Comments: The permit contains a requirement for the City to conduct a two year feasibility study to determine the facility's ability to remove nutrients (total nitrogen and total phosphorus). The requirement is in based on the 2013 Iowa Nutrient Reduction Strategy. The facility is required to evaluate the feasibility and reasonableness of reducing the amounts of nitrogen and phosphorus discharged into surface water. The report shall be submitted no later than *[24 months from permit issuance date]*.

Special Note: The DNR recently updated Chapter 63 of the Iowa Administrative Code which contains the monitoring and reporting requirements for NPDES permits. Most of the prescribed requirements for operational monitoring have been removed from Chapter 63; two requirements (TRC and lagoon cell depth) remain. While your reissued NPDES permits does not include the operational monitoring requirements of the past, the rule requires permittees to perform operational monitoring to ensure proper facility operation in accordance with the facility design, and requires permittees to maintain records of operational monitoring for three years. Thus, necessary operational monitoring can be performed at the discretion of your facility upon reissuance. Please note that operational monitoring requirements can still be placed in permits on a case-by-case basis.

City of Cedar Rapids

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This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 001	**ADW =43.77 mgd AWW =56.00 mgd (Diffuser discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
CBOD5 [1]	Technology based limits (mg/l)		Flow-variable limit (lbs/cfs/day)		
	113	277	20		--
Total D.O.	Minimum Concentration (mg/l)				
January - December	1.7				--
Ammonia – Nitrogen [2]			Flow-variable limits (lbs/cfs/day)		
January	--	--	22.2	55.1	--
February	--	--	24.8	61.8	--
March	--	--	11.8	47.9	--
April	--	--	8.9	**27.9**	--
May	--	--	8.9	**18.0**	--
June	--	--	5.7	**11.8**	--
July	--	--	4.6	**8.7**	--
August	--	--	4.1	**9.5**	--
September	--	--	6.3	**11.0**	--
October	--	--	12.0	**26.5**	--
November	--	--	14.6	37.8	--
December	--	--	16.9	43.9	--
Bacteria [3]	Geometric Mean (#org/100ml)		March 15th – November 15th		--
E. coli	126				
Chloride [4]	1,922	2,864	897,760	1,337,491	--
Sulfate [4]	6,964	6,964	3,252,500	3,252,500	--
TRC	0.244	0.390	114.2	182.3	--
pH [5]	5.9 to 14.0				--

Major Facility Acute WET Testing Ratio: use 21.0% of effluent and 79.0% of dilution water for the testing

1. The concentration limits are based on industrial adjustment, the flow-variable mass limit is water quality based.
2. The **bold** values are governed by the CBOD/DO modeling, the others are ammonia nitrogen toxicity based
3. Cedar River TMDL based limit. Due to a recent revision to IAC567.62 (Chapter 62), sample maximum limit for bacteria is no longer required. Only geometric mean is required.
4. Chloride/sulfate limits are based on the new chloride/sulfate criteria that took effective on Nov. 11, 2009. Chloride/sulfate criteria are hardness dependent and the default hardness has been changed from 100 mg/l to 200 mg/l, effective Nov. 11, 2009.
5. The lower and upper pH limits will likely be governed by the technology based limits of 6.0 to 9.0

By Collin Klingbeil

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 001	**ADW =43.77 mgd AWW =56.00 mgd (Diffuser discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
Toxics					
1,1,1-Trichloroethane	1.256E+02	1.256E+02	5.865E+04	5.865E+04	--
1,1-Dichloroethylene	1.725E+02	2.569E+02	8.057E+04	1.200E+05	--
1,2-Dichloroethane	8.990E+00	2.807E+02	4.199E+03	1.311E+05	--
1,2-Dichloropropane	3.645E+00	3.645E+00	1.702E+03	1.702E+03	--
2,3,7,8-TCDD (Dioxin)	1.239E-09	1.239E-09	5.788E-07	5.788E-07	--
3,3-Dichlorobenzidine	6.804E-03	6.804E-03	3.178E+00	3.178E+00	--
4,4' DDT	5.324E-06	5.233E-03	2.487E-03	2.444E+00	--
Aldrin	1.215E-05	1.427E-02	5.674E-03	6.665E+00	--
Aluminum	4.632E-01	3.568E+00	2.163E+02	1.666E+03	--
Antimony	3.407E+00	5.233E+01	1.591E+03	2.444E+04	--
Arsenic (III)	7.986E-01	1.617E+00	3.730E+02	7.554E+02	--
Barium	9.752E+02	9.752E+02	4.555E+05	4.555E+05	--
Benzene	1.239E+01	7.849E+01	5.788E+03	3.666E+04	--
Benzo(a)Pyrene	4.374E-03	4.374E-03	2.043E+00	2.043E+00	--
Beryllium	2.379E+00	2.379E+00	1.111E+03	1.111E+03	--
Bis(2-ethylhexyl)phthalate	5.346E-01	5.346E-01	2.497E+02	2.497E+02	--
Bromoform	3.402E+01	3.402E+01	1.589E+04	1.589E+04	--
Cadmium	2.408E-03	2.053E-02	1.125E+00	9.588E+00	--
Carbon Tetrachloride	3.888E-01	1.025E+02	1.816E+02	4.788E+04	--
Chlordane	2.289E-05	1.142E-02	1.069E-02	5.332E+00	--
Chloride	1.922E+03	2.864E+03	8.97760E+05	1.337491E+06	--
Chlorobenzene	8.519E+00	7.659E+01	3.979E+03	3.577E+04	--
Chlorodibromomethane	3.159E+00	3.159E+00	1.475E+03	1.475E+03	--
Chloroform	1.142E+02	1.142E+02	5.334E+04	5.334E+04	--
Chloropyrifos	2.183E-04	3.948E-04	1.020E-01	1.844E-01	--
Chromium (VI)	5.857E-02	7.611E-02	2.735E+01	3.555E+01	--
Copper	7.156E-02	1.121E-01	3.342E+01	5.236E+01	--
Cyanide	2.769E-02	1.047E-01	1.293E+01	4.888E+01	--
Dichlorobromomethane	4.131E+00	4.131E+00	1.929E+03	1.929E+03	--
Dieldrin	1.312E-05	1.142E-03	6.128E-03	5.332E-01	--
Endosulfan	2.982E-04	1.047E-03	1.392E-01	4.888E-01	--
Endrin	1.917E-04	4.091E-04	8.952E-02	1.911E-01	--
Ethylbenzene	1.118E+01	1.077E+02	5.222E+03	5.032E+04	--
Fluoride	3.842E+01	3.842E+01	1.795E+04	1.795E+04	--
gamma-Hexachlorocyclohexane (Lindane)	4.519E-03	4.519E-03	2.111E+00	2.111E+00	--
Heptachlor	1.920E-05	2.474E-03	8.965E-03	1.155E+00	--

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 001	**ADW =43.77 mgd AWW =56.00 mgd (Diffuser discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
Toxics					
Heptachlor epoxide	9.476E-06	2.474E-03	4.426E-03	1.155E+00	--
Hexachlorobenzene	7.047E-05	7.047E-05	3.291E-02	3.291E-02	--
Hexachlorocyclopentadiene	5.857E+00	5.857E+00	2.735E+03	2.735E+03	--
Iron	4.757E+00	4.757E+00	2.222E+03	2.222E+03	--
Lead	4.096E-02	9.391E-01	1.913E+01	4.386E+02	--
Mercury (II)	7.986E-04	7.802E-03	3.730E-01	3.644E+00	--
Nickel	4.992E-01	4.012E+00	2.332E+02	1.874E+03	--
Nitrate as N	1.522E+03	1.522E+03	7.110E+05	7.110E+05	--
Nitrate+Nitrite as N	1.522E+03	1.522E+03	7.110E+05	7.110E+05	--
para-Dichlorobenzene	1.012E+00	9.514E+00	4.725E+02	4.443E+03	--
Parathion	6.921E-05	3.092E-04	3.233E-02	1.444E-01	--
Pentachlorophenol (PCP)	9.734E-02	1.134E-01	4.546E+01	5.295E+01	--
Phenols	2.662E-01	1.189E+01	1.243E+02	5.554E+03	--
Polychlorinated Biphenyls (PCBs)	1.555E-05	9.514E-03	7.263E-03	4.443E+00	--
Polynuclear Aromatic Hydrocarbons (PAHs)	1.597E-04	1.427E-01	7.460E-02	6.665E+01	--
Selenium	2.662E-02	9.181E-02	1.243E+01	4.288E+01	--
Silver	1.808E-02	1.808E-02	8.443E+00	8.443E+00	--
Sulfate	6.964E+03	6.964E+03	3.252500E+06	3.252500E+06	--
Tetrachloroethlyene	8.019E-01	8.019E-01	3.745E+02	3.745E+02	--
Thallium	2.502E-03	2.845E+00	1.169E+00	1.329E+03	--
Toluene	2.662E-01	1.189E+01	1.243E+02	5.554E+03	--
Total Residual Chlorine (TRC)	2.44E-01	3.90E-01	1.142E+02	1.823E+02	--
Toxaphene	1.065E-05	3.473E-03	4.973E-03	1.622E+00	--
trans-1,2-Dichloroethylene	7.454E-01	7.454E-01	3.481E+02	3.481E+02	--
Trichloroethylene (TCE)	4.259E-01	1.903E+01	1.989E+02	8.887E+03	--
Vinyl Chloride	5.832E-01	5.832E-01	2.724E+02	2.724E+02	--
Zinc	1.025E+00	1.025E+00	4.789E+02	4.789E+02	--

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH) — Date Done: May 27, 2016

Annual critical low flow in Cedar River at the discharge point
30Q10 flow 420 cfs, 7Q10 flow 366 cfs, 1Q10 flow 318 cfs Harmonic mean flow 1,972 cfs

Excel Spreadsheet calculations [X] Qual II E Model [ ] Qual II E Modeling date[ ]

Performed by: Collin Klingbeil Approved By: Connie Dou

Antidegradation Review Requirement

Less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary for this outfall. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 004	**ADW =43.77 mgd AWW =56.00 mgd (Shoreline discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
CBOD5 [1]	Technology based limits (mg/l)		Flow-variable limit (lbs/cfs/day)		--
	113	277	20		
Total D.O.	Minimum Concentration (mg/l)				
January - December	1.6				--
Ammonia - Nitrogen			Flow-variable limits (lbs/cfs/day)		
January	--	--	2.0	2.0	--
February	--	--	1.9	1.9	--
March	--	--	1.9	1.9	--
April	--	--	2.0	2.0	--
May	--	--	1.9	1.9	--
June	--	--	1.8	1.8	--
July	--	--	1.4	2.2	--
August	--	--	1.3	2.1	--
September	--	--	2.0	2.1	--
October	--	--	2.0	2.0	--
November	--	--	1.9	1.9	--
December	--	--	2.1	2.1	--
Bacteria [2]	Geometric Mean (#org/100ml)		March 15th – November 15th		--
E. coli	126				
Chloride [3]	699	699	326,318	326,318	--
Sulfate [3]	1,684	1,684	786,504	786,504	--
TRC	0.222	0.321	103.7	150.0	--
pH [4]	6.5 to 9.2				--

Major Facility Acute WET Testing Ratio: use 89.5% of effluent and 10.5% of dilution water for the testing

1. The concentration limits are based on industrial adjustment, the flow-variable mass limit is water quality based.
2. Cedar River TMDL based limit. Due to a recent revision to IAC567.62 (Chapter 62), sample maximum limit for bacteria is no longer required. Only geometric mean is required.
3. Chloride/sulfate limits are based on the new chloride/sulfate criteria that took effective on Nov. 11, 2009. Chloride/sulfate criteria are hardness dependent and the default hardness has been changed from 100 mg/l to 200 mg/l, effective Nov. 11, 2009.
4. The upper pH limit will likely be governed by the technology based limit of 9.0.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 004	**ADW =43.77 mgd AWW =56.00 mgd (Shoreline discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
Toxics					
1,1,1-Trichloroethane	2.950E+01	2.950E+01	1.378E+04	1.378E+04	--
1,1-Dichloroethylene	5.879E+01	6.034E+01	2.746E+04	2.818E+04	--
1,2-Dichloroethane	3.064E+00	6.593E+01	1.431E+03	3.079E+04	--
1,2-Dichloropropane	1.242E+00	1.242E+00	5.801E+02	5.801E+02	--
2,3,7,8-TCDD (Dioxin)	4.223E-10	4.223E-10	1.972E-07	1.972E-07	--
3,3-Dichlorobenzidine	2.319E-03	2.319E-03	1.083E+00	1.083E+00	--
4,4' DDT	2.351E-06	1.229E-03	1.098E-03	5.741E-01	--
Aldrin	4.140E-06	3.352E-03	1.934E-03	1.566E+00	--
Aluminum	2.046E-01	8.381E-01	9.554E+01	3.914E+02	--
Antimony	1.505E+00	1.229E+01	7.028E+02	5.741E+03	--
Arsenic (III)	3.527E-01	3.799E-01	1.647E+02	1.774E+02	--
Barium	2.291E+02	2.291E+02	1.070E+05	1.070E+05	--
Benzene	4.223E+00	1.844E+01	1.972E+03	8.611E+03	--
Benzo(a)Pyrene	1.491E-03	1.491E-03	6.961E-01	6.961E-01	--
Beryllium	5.587E-01	5.587E-01	2.609E+02	2.609E+02	--
Bis(2-ethylhexyl)phthalate	1.822E-01	1.822E-01	8.508E+01	8.508E+01	--
Bromoform	1.159E+01	1.159E+01	5.414E+03	5.414E+03	--
Cadmium	1.063E-03	4.822E-03	4.967E-01	2.252E+00	--
Carbon Tetrachloride	1.325E-01	2.408E+01	6.188E+01	1.125E+04	--
Chlordane	1.011E-05	2.682E-03	4.722E-03	1.252E+00	--
Chloride	6.99E+02	6.99E+02	3.26318E+05	3.26318E+05	--
Chlorobenzene	3.762E+00	1.799E+01	1.757E+03	8.402E+03	--
Chlorodibromomethane	1.077E+00	1.077E+00	5.028E+02	5.028E+02	--
Chloroform	3.892E+01	3.892E+01	1.818E+04	1.818E+04	--
Chloropyrifos	9.274E-05	9.274E-05	4.332E-02	4.332E-02	--
Chromium (VI)	1.788E-02	1.788E-02	8.350E+00	8.350E+00	--
Copper	2.956E-02	2.956E-02	1.381E+01	1.381E+01	--
Cyanide	1.223E-02	2.458E-02	5.710E+00	1.148E+01	--
Dichlorobromomethane	1.408E+00	1.408E+00	6.575E+02	6.575E+02	--
Dieldrin	4.472E-06	2.682E-04	2.088E-03	1.252E-01	--
Endosulfan	1.317E-04	2.458E-04	6.150E-02	1.148E-01	--
Endrin	8.465E-05	9.610E-05	3.953E-02	4.488E-02	--
Ethylbenzene	4.938E+00	2.531E+01	2.306E+03	1.182E+04	--
Fluoride	9.025E+00	9.025E+00	4.215E+03	4.215E+03	--
gamma-Hexachlorocyclohexane (Lindane)	1.062E-03	1.062E-03	4.958E-01	4.958E-01	--
Heptachlor	6.542E-06	5.811E-04	3.055E-03	2.714E-01	--

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 004	**ADW =43.77 mgd AWW =56.00 mgd (Shoreline discharge when Cedar River flow at upstream USGS gage is less than 12,900 cfs)**				
Toxics					
Heptachlor epoxide	3.230E-06	5.811E-04	1.508E-03	2.714E-01	--
Hexachlorobenzene	2.401E-05	2.401E-05	1.122E-02	1.122E-02	--
Hexachlorocyclopentadiene	2.586E+00	2.586E+00	1.208E+03	1.208E+03	--
Iron	1.117E+00	1.117E+00	5.219E+02	5.219E+02	--
Lead	1.809E-02	2.206E-01	8.448E+00	1.030E+02	--
Mercury (II)	3.527E-04	1.833E-03	1.647E-01	8.559E-01	--
Nickel	2.205E-01	9.424E-01	1.030E+02	4.401E+02	--
Nitrate as N	3.576E+02	3.576E+02	1.670E+05	1.670E+05	--
Nitrate+Nitrite as N	3.576E+02	3.576E+02	1.670E+05	1.670E+05	--
para-Dichlorobenzene	4.467E-01	2.235E+00	2.086E+02	1.044E+03	--
Parathion	3.057E-05	7.263E-05	1.428E-02	3.392E-02	--
Pentachlorophenol (PCP)	2.663E-02	2.663E-02	1.244E+01	1.244E+01	--
Phenols	1.176E-01	2.794E+00	5.491E+01	1.305E+03	--
Polychlorinated Biphenyls (PCBs)	5.300E-06	2.235E-03	2.475E-03	1.044E+00	--
Polynuclear Aromatic Hydrocarbons (PAHs)	7.054E-05	3.352E-02	3.294E-02	1.566E+01	--
Selenium	1.176E-02	2.157E-02	5.491E+00	1.007E+01	--
Silver	4.246E-03	4.246E-03	1.983E+00	1.983E+00	--
Sulfate	1.684E+03	1.684E+03	7.86504E+05	7.86504E+05	--
Tetrachloroethlyene	2.733E-01	2.733E-01	1.276E+02	1.276E+02	--
Thallium	1.105E-03	6.682E-01	5.161E-01	3.121E+02	--
Toluene	1.176E-01	2.794E+00	5.491E+01	1.305E+03	--
Total Residual Chlorine (TRC)	2.22E-01	3.21E-01	1.037E+02	1.500E+02	--
Toxaphene	4.703E-06	8.157E-04	2.196E-03	3.810E-01	--
trans-1,2-Dichloroethylene	3.292E-01	3.292E-01	1.537E+02	1.537E+02	--
Trichloroethylene (TCE)	1.881E-01	4.470E+00	8.785E+01	2.087E+03	--
Vinyl Chloride	1.987E-01	1.987E-01	9.282E+01	9.282E+01	--
Zinc	2.409E-01	2.409E-01	1.125E+02	1.125E+02	--

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH) — Date Done: May 27, 2016

Annual critical low flow in Cedar River at the discharge point
30Q10 flow 420 cfs, 7Q10 flow 366 cfs, 1Q10 flow 318 cfs Harmonic mean flow 1,972 cfs

Excel Spreadsheet calculations [X] Qual II E Model [ ] Qual II E Modeling date[ ]

Performed by: Collin Klingbeil Approved By: Connie Dou

Antidegradation Review Requirement

Less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary for this outfall. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 117	**ADW =56.00 mgd AWW =56.00 mgd (Discharge when Cedar River flow at upstream USGS gage is greater than 12,900 cfs)**				
CBOD5 [1]	Technology based limits (mg/l)		Flow-variable limit (lbs/cfs/day)		
	113	277	--	--	--
Total D.O.	Minimum Concentration (mg/l)				
January - December	Dissolved Oxygen limits are not required				--
Ammonia - Nitrogen			Flow-variable limits (lbs/cfs/day)		
January	--	--	1.7	1.7	--
February	--	--	1.9	1.9	--
March	--	--	1.5	1.5	--
April	--	--	1.2	1.2	--
May	--	--	1.2	1.2	--
June	--	--	1.2	1.2	--
July	--	--	1.3	1.3	--
August	--	--	1.1	1.1	--
September	--	--	1.4	1.4	--
October	--	--	1.4	1.4	--
November	--	--	1.2	1.2	--
December	--	--	1.4	1.4	--
Bacteria [2]	Geometric Mean (#org/100ml)		March 15th – November 15th		--
E. coli	126				
Chloride [3]	2,946	2,946	1,376,028	1,376,028	--
Sulfate [3]	7,165	7,165	3,346,481	3,346,481	--
TRC	0.393	0.393	183.6	183.6	--
pH [4]	5.9 to 14.0				--

Major Facility Acute WET Testing Ratio: use 20.4% of effluent and 79.6% of dilution water for the testing

1. The concentration limits are based on industrial adjustment and always govern at USGS gage flows exceeding 12,900 cfs, thus no flow-variable water quality based CBOD5 limit is provided for this outfall.
2. Cedar River TMDL based limit. Due to a recent revision to IAC567.62 (Chapter 62), sample maximum limit for bacteria is no longer required. Only geometric mean is required.
3. Chloride/sulfate limits are based on the new chloride/sulfate criteria that took effective on Nov. 11, 2009. Chloride/sulfate criteria are hardness dependent and the default hardness has been changed from 100 mg/l to 200 mg/l, effective Nov. 11, 2009.
4. The upper and lower pH limits will likely be governed by the technology based limits of 6.0 to 9.0.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 117	**ADW =56.00 mgd AWW =56.00 mgd (Discharge when Cedar River flow at upstream USGS gage is greater than 12,900 cfs)**				
Toxics					
1,1,1-Trichloroethane	1.292E+02	1.292E+02	6.036E+04	6.036E+04	--
1,1-Dichloroethylene	2.644E+02	2.644E+02	1.235E+05	1.235E+05	--
1,2-Dichloroethane	1.478E+01	2.889E+02	6.905E+03	1.349E+05	--
1,2-Dichloropropane	5.994E+00	5.994E+00	2.799E+03	2.799E+03	--
2,3,7,8-TCDD (Dioxin)	2.038E-09	2.038E-09	9.518E-07	9.518E-07	--
3,3-Dichlorobenzidine	1.119E-02	1.119E-02	5.225E+00	5.225E+00	--
4,4' DDT	3.996E-05	5.385E-03	1.866E-02	2.515E+00	--
Aldrin	1.998E-05	1.469E-02	9.331E-03	6.860E+00	--
Aluminum	3.476E+00	3.672E+00	1.624E+03	1.715E+03	--
Antimony	2.557E+01	5.385E+01	1.194E+04	2.515E+04	--
Arsenic (III)	1.665E+00	1.665E+00	7.774E+02	7.774E+02	--
Barium	1.004E+03	1.004E+03	4.687E+05	4.687E+05	--
Benzene	2.038E+01	8.078E+01	9.518E+03	3.773E+04	--
Benzo(a)Pyrene	7.192E-03	7.192E-03	3.359E+00	3.359E+00	--
Beryllium	2.448E+00	2.448E+00	1.143E+03	1.143E+03	--
Bis(2-ethylhexyl)phthalate	8.791E-01	8.791E-01	4.106E+02	4.106E+02	--
Bromoform	5.594E+01	5.594E+01	2.613E+04	2.613E+04	--
Cadmium	1.807E-02	2.113E-02	8.440E+00	9.868E+00	--
Carbon Tetrachloride	6.393E-01	1.055E+02	2.986E+02	4.927E+04	--
Chlordane	1.718E-04	1.175E-02	8.025E-02	5.488E+00	--
Chloride	2.946E+03	2.946E+03	1.376028E+06	1.376028E+06	--
Chlorobenzene	6.393E+01	7.882E+01	2.986E+04	3.681E+04	--
Chlorodibromomethane	5.195E+00	5.195E+00	2.426E+03	2.426E+03	--
Chloroform	1.878E+02	1.878E+02	8.771E+04	8.771E+04	--
Chloropyrifos	4.064E-04	4.064E-04	1.898E-01	1.898E-01	--
Chromium (VI)	7.833E-02	7.833E-02	3.658E+01	3.658E+01	--
Copper	1.152E-01	1.152E-01	5.383E+01	5.383E+01	--
Cyanide	1.077E-01	1.077E-01	5.030E+01	5.030E+01	--
Dichlorobromomethane	6.793E+00	6.793E+00	3.173E+03	3.173E+03	--
Dieldrin	2.158E-05	1.175E-03	1.008E-02	5.488E-01	--
Endosulfan	1.077E-03	1.077E-03	5.030E-01	5.030E-01	--
Endrin	4.210E-04	4.210E-04	1.966E-01	1.966E-01	--
Ethylbenzene	8.391E+01	1.109E+02	3.919E+04	5.179E+04	--
Fluoride	3.954E+01	3.954E+01	1.847E+04	1.847E+04	--
gamma-Hexachlorocyclohexane (Lindane)	4.651E-03	4.651E-03	2.172E+00	2.172E+00	--
Heptachlor	3.157E-05	2.546E-03	1.474E-02	1.189E+00	--

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS (Cont'd)

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
Outfall No. 117	**ADW =56.00 mgd AWW =56.00 mgd (Discharge when Cedar River flow at upstream USGS gage is greater than 12,900 cfs)**				
Toxics					
Heptachlor epoxide	1.558E-05	2.546E-03	7.278E-03	1.189E+00	--
Hexachlorobenzene	1.159E-04	1.159E-04	5.412E-02	5.412E-02	--
Hexachlorocyclopentadiene	4.395E+01	4.395E+01	2.053E+04	2.053E+04	--
Iron	4.896E+00	4.896E+00	2.287E+03	2.287E+03	--
Lead	3.074E-01	9.665E-01	1.436E+02	4.514E+02	--
Mercury (II)	5.994E-03	8.029E-03	2.799E+00	3.750E+00	--
Nickel	3.747E+00	4.129E+00	1.750E+03	1.928E+03	--
Nitrate as N	1.567E+03	1.567E+03	7.317E+05	7.317E+05	--
Nitrate+Nitrite as N	1.567E+03	1.567E+03	7.317E+05	7.317E+05	--
para-Dichlorobenzene	7.592E+00	9.792E+00	3.546E+03	4.573E+03	--
Parathion	3.182E-04	3.182E-04	1.486E-01	1.486E-01	--
Pentachlorophenol (PCP)	1.167E-01	1.167E-01	5.449E+01	5.449E+01	--
Phenols	1.998E+00	1.224E+01	9.331E+02	5.716E+03	--
Polychlorinated Biphenyls (PCBs)	2.557E-05	9.792E-03	1.194E-02	4.573E+00	--
Polynuclear Aromatic Hydrocarbons (PAHs)	1.199E-03	1.469E-01	5.599E-01	6.860E+01	--
Selenium	9.449E-02	9.449E-02	4.413E+01	4.413E+01	--
Silver	1.860E-02	1.860E-02	8.689E+00	8.689E+00	--
Sulfate	7.165E+03	7.165E+03	3.346481E+06	3.346481E+06	--
Tetrachloroethlyene	1.319E+00	1.319E+00	6.158E+02	6.158E+02	--
Thallium	1.878E-02	2.928E+00	8.771E+00	1.367E+03	--
Toluene	1.998E+00	1.224E+01	9.331E+02	5.716E+03	--
Total Residual Chlorine (TRC)	3.93E-01	3.93E-01	1.836E+02	1.836E+02	--
Toxaphene	7.992E-05	3.574E-03	3.732E-02	1.669E+00	--
trans-1,2-Dichloroethylene	5.594E+00	5.594E+00	2.613E+03	2.613E+03	--
Trichloroethylene (TCE)	3.197E+00	1.958E+01	1.493E+03	9.146E+03	--
Vinyl Chloride	9.590E-01	9.590E-01	4.479E+02	4.479E+02	--
Zinc	1.055E+00	1.055E+00	4.929E+02	4.929E+02	--

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH) — Date Done: May 27, 2016

Annual critical low flow in Cedar River at the discharge point
30Q10 flow 13,500 cfs, 7Q10 flow 13,500 cfs, 1Q10 flow 13,500 cfs Harmonic mean flow 13,500 cfs

Excel Spreadsheet calculations [X] Qual II E Model [ ] Qual II E Modeling date[ ]

Performed by: Collin Klingbeil Approved By: Connie Dou

Antidegradation Review Requirement

Less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary for this outfall. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

WLA/permit limits for the City of Cedar Rapids' Wastewater Discharge

These wasteload allocations and water quality based permit limitations are for the City of Cedar Rapids' wastewater discharge. The wasteload allocations/permit limits are based on the Water Quality Standards (IAC 567.61) and 'Supporting Document for Iowa Water Quality Management Plans,' Chapter IV, November 11, 2009. The chloride allocation/permit limits are based on the criteria that became effective on November 11, 2009.

The water quality based limits in this WLA are calculated to meet the surface water quality criteria to protect downstream uses. There could be technology based limits applicable to this facility that are more stringent than the water quality based limits shown in this WLA. The technology based limits could be derived from either federal guidelines based on different industrial categories or permit writer's judgment.

1. BACKGROUND: The City of Cedar Rapids discharges treated domestic wastewater from a mechanical wastewater treatment system into the Cedar River through an effluent diffuser (Outfall 001) (at 41° 57' 20.988" N, 91° 33' 56.016" W) and potentially via shoreline discharge (Outfall 004) (at 41° 57' 22.248" N, 91° 33' 51.012" W) under low or normal flow conditions and either from the diffuser or shoreline discharge during elevated flow conditions (Outfall 117).

Discharge Scenarios:
The outfall of this facility is equipped with a gravity flow effluent diffuser. The diffuser was designed to discharge effluent through 58 of the 73 diffuser ports that span the Cedar River, which is 80% of the river width. Thus the WLAs for the diffuser will be calculated assuming mixing zone (MZ) and zone of initial dilution (ZID) percentages of 80%.

Under normal conditions 100% of the effluent flow from this facility is discharged via the diffuser (Outfall 001). A shoreline discharge may occur during normal flow conditions (Outfall 004) for maintenance or repair. Additionally, during periods of high flow in the Cedar River effluent may be discharged completely through the diffuser, through a combination of the diffuser and shoreline discharge, or completely through the shoreline discharge (Outfall 117). Limits for Outfall 117 are calculated based on the assumption of 100% shoreline discharge, which is protective of all modes of discharge during elevated river flow conditions.

Three sets of water quality based effluent limits are calculated for this facility:

- Outfall 001 – diffuser discharge when the Cedar River flows are low
- Outfall 004 – shoreline discharge when the Cedar River flows are low
- Outfall 117 – diffuser/shoreline discharge when the Cedar River flows are high

Route of Flow/Use Designations:
The Cedar River is an A1, B(WW-1), HH designated use waterbody from the outfall of this facility to the mouth (Louisa Co.). The designations have been adopted in Iowa's state rule described in the rule referenced document of Surface Water Classification effective on June 17, 2015. Based on the pollutants of concern the use designations of stream segments further downstream will not impact the resulting limits for this facility.

Stream Flows:
The annual critical low flows in the Cedar River at the discharge point for Outfall 001 and Outfall 004 WLA calculations are estimated based on the Drainage Area Ratio method and flow statistics obtained at USGS gage station 05464500, located on the Cedar River at Cedar Rapids, Iowa.

Table 1a: Annual Critical Low Flows

Location	Drainage Area (squaremile)	Harmonic Mean (cfs)	Annual critical low flows (cfs)		
			1Q10	7Q10	30Q10
USGS Gage (05464500)	6,510	1,880[$]	303[$]	349[$]	400[$]
Outfall 001	6,828	1,972[@]	318[@]	366[@]	420[@]
Outfall 004	6,828	1,972[@]	318[@]	366[@]	420[@]

[$]: USGS gage station statistic data
[@]: Estimated based on drainage area ratio method

The expected flows in the Cedar River during a high flow shoreline discharge event are based on the attached *Technical Memo from HDR from October 2, 2013 for the CRWPCF Headworks Local Limits Study* (TM) project. There is an inverse correlation between the water surface elevation of the Cedar River at the discharge point and the capacity of the diffuser. At water surface elevations above 701.0 feet the head box of the diffuser will be flooded and 100% of the effluent flow is released via shoreline discharge. A regression equation (R-squared = 0.9823) was developed to correlate the river flow at USGS gage 05464500 to the water surface elevation at the outfall (elevation data at outfall collected in 1999):

Cedar River Elevation at Plant Outfall, ft = 0.0004 * (Cedar River flow at USGS gage, cfs) + 689.63

Based on the regression equation 100% shoreline discharge is expected to occur when the flow in the Cedar River at the USGS gage is 28,425 cfs or higher (assuming a weir elevation of 701.0 feet). Based on the TM from HDR, shoreline discharge is expected to begin when the flow in the Cedar River at the USGS gage is between 21,000 cfs and 26,000 cfs. Due to the variability of the other factors affecting the diffusers ability to discharge 100% of the effluent flow (active diffuser ports, effluent flow, etc.) some level of safety factor must be considered; thus 13,500 cfs is used as the background flow in the Cedar River at the outfall of this facility for the calculations of the wasteload allocations for Outfall 117. Based on the drainage area ratio method it is expected that the flow at the upstream USGS gage will be approximately 12,900 cfs when the stream flow at the outfall is 13,500 cfs. When the stream flow at the USGS gage is greater than or equal to 12,900 cfs Outfall 117 limits will apply. The limits for Outfall 001 (diffuser) apply when the stream flow at the USGS gage is less than 12,900 cfs except when there is a shoreline discharge, when the limits for Outfall 004 apply.

Table 1b: Annual Critical Low Flows

Location	Drainage Area (squaremile)	Harmonic Mean (cfs)	Annual critical low flows (cfs)		
			1Q10	7Q10	30Q10
Outfall 117	6,828	13,500[#]	13,500[#]	13,500[#]	13,500[#]

[#]: Stream flows at the outfall for the calculation of the high flow WLAs

Correlation between AWW and High Stream Flow: The City of Cedar Rapids has shown that the AWW only occurs during elevated river flow conditions. Thus, the mass limits for Outfall 001 and Outfall 004 are based on the AWW flow and the ADW based wasteload allocations. Since the limits for Outfall 117 apply under elevated flow conditions both the concentration and mass limits are based on the AWW flow.

Flow-Variable Limits: In the existing NPDES permit and in the past the City of Cedar Rapids has had flow variable ammonia nitrogen and CBOD5 limits. This WLA also considers flow-variable limits for ammonia nitrogen and CBOD5 for all outfalls.

CBOD5 Limits: In the existing NPDES permit this facility was given technology based CBOD5 concentration limits with an industrial adjustment of a 30-day average of 113 mg/L and a daily maximum of 277 mg/L. In addition, this facility was given a flow-variable water quality based CBOD5 limit of 20 lbs/cfs/day. A newly calculated industrial adjustment would allow for slightly higher technology based

CBOD5 concentration limits; however antidegradation review would be triggered. The city has instead requested to use the previous NPDES permit limits for CBOD5. The minimum of the derived concentration from the flow-variable CBOD5 limit of 20 lbs/cfs/day and 277 mg/L is used in the CBOD/DO modeling.

At river flows at or above 13,500 cfs the CBOD5 level of 277 mg/l governs over the flow-variable value of 20 lbs/cfs/day, thus no flow-variable CBOD5 limit is given to Outfall 117.

2. ANTIDEGRADATION REVIEW REQUIREMENT:
According to the Iowa Antidegradation Implementation Procedure, effective February 17, 2010 (IAC 567-61.2(2).e), all new or expanded regulated activities (with limited exceptions, such as unsewered communities) are subject to antidegradation review requirements.

Table 2a: Outfall 001 – Diffuser Discharge Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☐, No ☒, or Not Applicable ☐	1: Existing design capacity sheet attached
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
4	Less Stringent Permit limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Current limits sheet attached 2: Various less stringent limits
5	Outfall Location Change	Yes ☐, No ☒, or Not Applicable ☐	

Conclusion and discussion:

Due to Item 4, less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary for this outfall.

Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

Table 2b: Outfall 004 – Low Flow Shoreline Discharge Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☐, No ☒, or Not Applicable ☐	1: Existing design capacity sheet attached
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
4	Less Stringent Permit limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Current limits sheet attached 2: Various less stringent limits
5	Outfall Location Change	Yes ☐, No ☒, or Not Applicable ☐	

Conclusion and discussion:

Due to Item 4, less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary.

Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

Table 2c: Outfall 117 – High Flow Diffuser/Shoreline Discharge Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☐, No ☒, or Not Applicable ☐	1: Existing design capacity sheet attached
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	As indicated in the request form
4	Less Stringent Permit limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Current limits sheet attached 2: Various less stringent limits
5	Outfall Location Change	Yes ☐, No ☒, or Not Applicable ☐	

Conclusion and discussion:

Due to Item 4, less stringent limits is the only factor that triggers antidegradation review. If the more stringent limits between those in the current NPDES permit and those in this report were to be used in the renewal NPDES permit, the antidegradation review is not necessary.

Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

3. TOTAL MAXIMUM DAILY LOAD (TMDL) LIMITATIONS:

The following stream segments in the discharge route are on the 2014 impaired waters list:

- The Cedar River for primary contact – indicator bacteria, aquatic life – biological (mussels), primary contact and aquatic life – pH
- The Iowa River for primary contact – indicator bacteria
- The Mississippi River for aquatic life – aluminum

A TMDL was completed for the Cedar River for *E. coli* in 2010. This facility was assigned limits of a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th.

TMDLs for the other impaired segments in the route of flow downstream from this facility have not been completed.

Please note that the results presented in this report are wasteload allocations based on meeting the State's current water quality standards in the receiving waterbody. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations. Information on impaired streams in Iowa and approved TMDLs can be found at the following website: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement/Impaired-Waters

4. CALCULATIONS:

Outfall 001: The wasteload allocations / permit limits for this outfall are calculated based on the facility's Average Dry Weather (ADW) design flow of 43.77 mgd and its Average Wet Weather (AWW) design flow of 56.00 mgd.

Outfall 004: The wasteload allocations / permit limits for the low flow shoreline discharge are calculated based on the facility's Average Dry Weather (ADW) design flow of 43.77 mgd and its Average Wet Weather (AWW) design flow of 56.00 mgd.

Outfall 117: The wasteload allocations / permit limits for the high flow diffuser/shoreline discharge are calculated based on the facility's Average Wet Weather (AWW) design flow of 56.00 mgd since it has been shown that the AWW discharge flow only occurs during elevated river flow conditions.

Please note that only wasteload allocations/permit limits (water quality based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality based permit concentration limits are derived using the allowed stream flow and the ADW design flow, while loading limits are derived using the allowed stream flow and the AWW design flow. The City has demonstrated that the AWW only occurs during elevated river flow conditions.

Toxics: The Toxics wasteload allocations will consider the procedures included in the 2000 revised WQS and the 2007 chemical criteria.

Outfall 001:

To protect the aquatic life use:
The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 80% of the 7Q10 flow and 80% of the 1Q10 flow in the Cedar River are used as the Mixing Zone (MZ) and Zone of Initial Dilution (ZID), respectively.

To protect the HH use:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 80% of the 7Q10 flow in the receiving stream.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 80% of the harmonic mean flow in the receiving stream.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 7/week; the limits for other toxics are based on a sampling frequency of 1/week.

Outfall 004:

To protect the aquatic life use:
The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in the Cedar River are used as the Mixing Zone (MZ) and Zone of Initial Dilution (ZID), respectively.

To protect the HH use:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 7Q10 flow in the receiving stream.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the harmonic mean flow in the receiving stream.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 7/week; the limits for other toxics are based on a sampling frequency of 1/week.

Outfall 117:

To protect the aquatic life use:
In this case, 25% of the 13,500 cfs high flow and 2.5% of the 13,500 cfs high flow in the Cedar River at the outfall are used as the Mixing Zone (MZ) and Zone of Initial Dilution (ZID), respectively.

To protect the HH use:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 13,500 cfs high flow in the Cedar River at the outfall.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 13,500 cfs high flow in the Cedar River at the outfall.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 7/week; the limits for other toxics are based on a sampling frequency of 1/week.

Ammonia Nitrogen (Flow-variable): Standard stream background temperatures, pH, and site specific concentrations of NH3-N (based on data collected at STORET site 10570002 which is located approximately 21 river miles upstream from the outfall on the Cedar River) were mixed with the discharge from the facility's effluent pH and temperature values to calculate the applicable instream WQS criteria for the protection of Cedar River. There are very few data points at the closer USGS gage station 05464500 which is why the STORET site data is ultimately used in the calculation of the wasteload allocations.

The Cedar River is a B(WW-1) stream, therefore, early life protection will begin in March and run through September.

The calculation is to establish both average and maximum flow-variable limits for ammonia nitrogen. The WLAs are based on the acute and chronic instream ammonia criteria converted to lbs/day/cfs using the following equations:

Chronic WLA (lbs/cfs/day) = (CCC – C_R) * 8.34 * 0.646 * MZ
Acute WLA (lbs/cfs/day) = (CMC – C_R) * 8.34 * 0.646 * ZID

Where: CCC = Chronic instream ammonia nitrogen criterion, mg/L
CMC = Acute instream ammonia nitrogen criterion, mg/L
C_R = Background ammonia nitrogen concentration, mg/L
MZ & ZID = Mixing zone and zone of initial dilution factor, 0 – 1
8.34 and 0.646 are conversion factors

The chronic and acute flow-variable ammonia nitrogen WLAs are converted to Average Monthly and Maximum Daily permit limits using the permit derivation procedure.

The facility will need to calculate, at the frequency specified in the permit, the mass of ammonia nitrogen discharged to the Cedar River in terms of lbs/cfs/day by:

$$\frac{Q_D \, C_D \, 8.34}{Q_R} = \text{Flow Variable Value (lbs/cfs/day)}$$

Where: Q_D = Discharge Flow, mgd
C_D = Discharge Ammonia Concentration, mg/l
Q_R = River Flow, cfs

It is important to note that the Discharge Monitoring Reports (DMRs) will treat the flow-variable ammonia nitrogen limits the same as any other parameter. Monthly average and the daily maximum values will be included in the DMR. Compliance will be achieved when the monthly average and daily maximum are less than or equal to the permit limits. The DMR will need to record river flow (in cfs) at the same frequency as the ammonia nitrogen monitoring along with the effluent discharge flow to facilitate checking the results of this equation.

The monthly background temperatures, pH, and NH3-N concentrations shown in Table 3 are used for the wasteload allocation/permit limits calculations based on the Year 2000 ammonia criteria. Table 4 shows the statewide monthly effluent pH and temperature values for mechanical facilities. Tables 5a – 5c show the calculated ammonia nitrogen waste load allocations for each outfall.

Outfall 001: Due to the diffuser 80% of the 1Q10 and 80% of the 30Q10 flow are used as the ZID and the MZ.

Outfall 004: Since the limits are flow-variable, a default ZID of 2.5% of the 1Q10 and a MZ of 25% of the 30Q10 flow are used in the calculations instead of basing the ZID and MZ on the ratio of the stream flow to the discharging flow.

Outfall 117: Since the limits are flow-variable, a default ZID of 2.5% of the 1Q10 and a MZ of 25% of the 30Q10 flow are used in the calculations instead of basing the ZID and MZ on the ratio of the stream flow to the discharging flow.

Table 3: Background Temperature, pH and NH3-N Concentrations
For Use with Year 2000 Ammonia Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
January	7.8	0.6	0.025
February	7.7	1.2	0.050
March	7.9	4.3	0.050
April	8.1	11.7	0.025
May	8.1	16.6	0.025
June	8.1	21.4	0.025
July	8.1	24.8	0.025
August	8.2	23.8	0.025
Sept.	8.0	22.2	0.025
October	8.0	12.3	0.025
November	8.1	6	0.025
December	8.0	1.6	0.025

Table 4: Standard Effluent pH & Temperature Values for Mechanical Facilities

Months	pH	Temperature (°C)
January	7.67	12.4
February	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.7	22.1
July	7.58	24.1
August	7.63	24.4
Sept.	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

Table 5a: Outfall 001-Waste Load Allocations for Ammonia Nitrogen for the Protection of Aquatic Life

Months	ADW-Based	
	Acute (mg/l)	Chronic (mg/l)
January	55.1	22.2
February	61.8	24.8
March	47.9	11.8
April	39.0	8.9
May	38.4	8.9
June	37.5	5.7
July	41.4	4.6
August	35.9	4.1
Sept.	44.5	6.3
October	43.6	12.0
November	37.8	14.6
December	43.9	16.9

Table 5b: Outfall 004 - Waste Load Allocations for Ammonia Nitrogen for the Protection of Aquatic Life

Months	ADW-Based	
	Acute (mg/l)	Chronic (mg/l)
January	2.0	6.9
February	1.9	7.8
March	1.9	3.7
April	2.0	2.8
May	1.9	2.8
June	1.8	1.8
July	2.2	1.4
August	2.1	1.3
Sept.	2.1	2.0
October	2.0	3.7
November	1.9	4.6
December	2.1	5.3

Table 5c: Outfall 117 - Waste Load Allocations for Ammonia Nitrogen for the Protection of Aquatic Life

Months	ADW-Based	
	Acute (mg/l)	Chronic (mg/l)
January	1.7	6.9
February	1.9	7.8
March	1.5	3.7
April	1.2	2.8
May	1.2	2.8
June	1.2	1.8
July	1.3	1.4
August	1.1	1.3
Sept.	1.4	2.0
October	1.4	3.7
November	1.2	4.6
December	1.4	5.3

CBOD5/Total Dissolved Oxygen:
Streeter-Phelps DO Sag Model was used to simulate the decay of CBOD and dispersion of total Dissolved Oxygen (DO) in the receiving water downstream from the outfall. The criterion is that the discharge cannot cause the DO level in the receiving stream (warm waters) below 5.0 mg/l.

Note: Modeling is completed for Outfall 001, Outfall 004, and Outfall 117. The inputs to the model for each scenario are the same unless otherwise specified below.

The parameter values used in the modeling are listed below:

Background: The temperature and ammonia nitrogen levels are shown in Table 3. The ultimate CBOD and DO levels were based on sampling data from STORET site 10570002 which is approximately 21 river miles upstream from the outfall of this facility on the Cedar River. The median value of 2.0 mg/l from the dataset was selected for CBOD5 and was adjusted to CBODu for each month based on the background water temperature. The minimum DO level from the dataset is 5.8 mg/l. The minimum DO value was used since the modeling is based on maintaining a minimum DO level in the receiving stream set by water quality standards.

Effluent: The temperatures are shown in Table 4. The ammonia nitrogen values used in the modeling are derived from the flow-variable wasteload allocations shown in Tables 5a – 5c. ADW and AWW based acute and chronic WLAs (in mg/l) are back calculated from the flow-variable wasteload allocations at various background flow conditions (7Q10, 5*7Q10, 10*7Q10, 20*7Q10, etc.) to ensure the DO standard is met. The CBOD5 level used in the modeling is the minimum between the derived concentration from a flow-variable limit of 20 lbs/cfs/day and 277 mg/l, which is the industrial adjustment from the technology based maximum concentration of 40 mg/l.

Table 6: Effluent CBOD5 Concentrations

Outfalls	Flow Condition	Flow (cfs)	CBOD5 (mg/l)
001, 004	7Q10+ADW	433.71	20.1
	7Q10+AWW	452.63	15.7
	7Q10*5 + ADW	1,897.71	100.3
	7Q10*5 + AWW	1,916.63	78.4
	7Q10*10 + ADW	3,727.71	200.5
	7Q10*10 + AWW	3,746.63	156.7
	7Q10*20 + ADW	7,387.71	277.0
	7Q10*20 + AWW	7,406.63	277.0
001, 004, 117	13,500 cfs + ADW	13,567.71	277.0
	13,500 cfs + AWW	13,586.63	277.0
117	7Q10*50 + ADW	18,367.71	277.0
	7Q10*50 + AWW	18,386.63	277.0
	7Q10*100 + ADW	36,667.71	277.0
	7Q10*100 + AWW	36,686.63	277.0

Receiving stream parameters: There is an average water channel slope of 0.000321 (the water channel elevation changes from 700 ft near the outfall to 680 ft over a distance of approximately 11.8 miles, estimated based on the USGS 7.5' topographic map).

USGS gage 05464500, located on the Cedar River at Cedar Rapids, IA, had field measurement data, such as stream flow, cross section area, stream width and velocity. The stream depth is not reported, however, can be derived using the following equation:

Depth = Cross Sectional Area / Width

Regression equations of Ln (Velocity) vs. Ln (Flow) and Ln (Depth) vs. Ln (Flow) were established with acceptable R-squared values:

Ln (Velocity) = 0.3828*Ln (Flow) - 2.2327 R-squared = 0.8659
Ln (Depth) = 0.5288*Ln (Flow) - 3.2305 R squared = 0.8411

The width can be derived by using the following equation:

Width = Flow / Velocity / Depth

The gage is about 7.5 miles upstream of the discharge. Therefore in the absence of other data that could be used to estimate stream width, depth and velocity, it is assumed that the above regression equations are valid at the outfall. Since there are flow-variable limits for both ammonia nitrogen and CBOD5 the modeling is completed under a range of flow conditions.

Table 7: Stream Width, Depth and Velocity

Outfalls	Flow Condition	Flow (cfs)	Width (ft)	Depth (ft)	Velocity (fps)
001, 004	7Q10+ADW	433.71	403.4	0.98	1.10
	7Q10+AWW	452.63	405.0	1.00	1.11
	7Q10*5 + ADW	1,897.71	459.7	2.14	1.93
	7Q10*5 + AWW	1,916.63	460.1	2.15	1.94
	7Q10*10 + ADW	3,727.71	487.9	3.06	2.50
	7Q10*10 + AWW	3,746.63	488.1	3.07	2.50
	7Q10*20 + ADW	7,387.71	518.3	4.39	3.25
	7Q10*20 + AWW	7,406.63	518.5	4.40	3.25
001, 004, 117	13,500 cfs + ADW	13,567.71	547.0	6.06	4.10
	13,500 cfs + AWW	13,586.63	547.0	6.06	4.10
117	7Q10*50 + ADW	18,367.71	561.8	7.11	4.60
	7Q10*50 + AWW	18,386.63	561.8	7.11	4.60
	7Q10*100 + ADW	36,667.71	597.2	10.25	5.99
	7Q10*100 + AWW	36,686.63	597.2	10.25	5.99

Reaeration: The Cedar River is a large stream with relatively uniform flow characteristics. Thus, the channel-control reaeration model developed by Melching and Flores (1999) is the most applicable and is used in the modeling.

Discussion and Conclusion:

Outfall 001: The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of the minimum between 20 lbs/cfs/day and 277 mg/l, and a minimum DO level of 1.7 mg/l, will not cause the DO level in the receiving stream below 5.0 mg/l at any time, however, some of the calculated water quality based flow-variable ammonia nitrogen limits, as shown in Table 5a, need to be reduced. The final flow-variable ammonia nitrogen limits are shown in Page 1 of this report.

Outfall 004: The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of the minimum between 20 lbs/cfs/day and 277 mg/l, a minimum DO level of 1.6 mg/l, and flow-variable ammonia nitrogen levels as shown in Table 5b will not cause the DO level in the receiving stream below 5.0 mg/l at any time. The final ammonia nitrogen limits are shown on page 4 of this report.

Outfall 117: The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of 277 mg/l (at river flows at or above 13,500 cfs the CBOD5 level of 277 mg/l governs over the flow-variable value of 20 lbs/cfs/day) flow-variable ammonia nitrogen levels as shown in Table 5c will not cause the DO level in the receiving stream below 5.0 mg/l at any time. Numerical DO limits are not required. The final ammonia nitrogen limits are shown on page 7 of this report.

***E. coli*:**

Outfall 001, 004, 117:

The facility discharges into a Class (A1) water body. The water quality standard for *E. coli* in a Class (A1) water body is a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th. The criteria apply at "end-of-pipe".

A TMDL was completed for the Cedar River for *E. coli* in 2010. This facility was assigned limits of a Geometric Mean of 126 org./100 ml and a Sample Maximum of 235 org./100 ml from March 15th through November 15th. These limits match the water quality based limits listed above.

However, the recent chapter 62 revision that became effective on Oct. 14, 2009 states "…that the daily sample maximum criteria for *E. coli* set forth in Part E of the 'Supporting Document for Iowa Water Quality Management Plans' shall not be used as an end-of-pipe permit limitation." Therefore, only the geometric mean limit of 126 org./100 ml applies to this facility.

Chloride and Sulfate:
The new chloride and sulfate criteria became effective on Nov. 11, 2009. The default hardness for background and effluent has been changed from 100 mg/l to 200 mg/l, effective on Nov. 11, 2009.

Chloride criteria are functions of hardness and sulfate concentration, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$

The criteria apply to all Class B waters.

Sulfate criteria, shown in Table 8, are functions of hardness and chloride concentration.

Table 8: Sulfate Criteria

Hardness (mg/l as CaCO3)	Sulfate Criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The criteria defined in Table 8 serve as both acute and chronic criteria and apply to all Class B waters.

The default chloride and sulfate concentration for both background water and effluent are 34 and 63 mg/l, respectively.

Outfall 001: The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, due to the diffuser 80% of the 7Q10 flow and 80% of the 1Q10 flow in Cedar River are used as the MZ and the ZID, respectively.

Outfall 004: The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in Cedar River are used as the MZ and the ZID, respectively.

Outfall 117: The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 25% of the 13,500 cfs high flow and 2.5% of the 13,500 cfs high flow in the Cedar River are used as the MZ and the ZID, respectively.

Iron:
Outfall 001: The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for designated streams. In this case, the ZID is 80% of the 1Q10 at the discharging point.

Outfall 004: The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for designated streams. In this case, the ZID is 2.5% of the 1Q10 at the discharging point.

Outfall 117: The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for designated streams. In this case, the ZID is 2.5% of the 13,500 cfs high flow at the discharging point.

pH:
Outfall 001: Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the ZID. In this case, the ZID is 80% of the 1Q10 at the discharging point.

Outfall 004: Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the ZID. In this case, the ZID is 2.5% of the 1Q10 at the discharging point.

Outfall 117: Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the ZID. In this case, the ZID is 2.5% of the 13,500 cfs high flow at the discharging point.

TDS: Effective Nov. 11, 2009, the site-specific TDS approach is no longer applicable; instead the new chloride and sulfate criteria became applicable. However, the TDS level should be controlled to a level such that the narrative criteria stated in IAC 567.61.3.(2) be fulfilled.

Major Facility Acute WET testing Ratio:
Outfall 001: Use 21.0% of effluent and 79.0% of dilution water for the testing. The ratio was calculated using ADW design flow and 80% of 1Q10 as the ZID.

Outfall 004: Use 89.5% of effluent and 10.5% of dilution water for the testing. The ratio was calculated using ADW design flow and 2.5% of 1Q10 as the ZID.

Outfall 117: Use 20.4% of effluent and 79.6% of dilution water for the testing. The ratio was calculated using AWW design flow and 2.5% of the 13,500 cfs high flow as the ZID.

5. PERMIT LIMITATIONS: - *Based on the Year 2006 Water Quality Standards & 2002 Permit Derivation Procedure.*

The acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The water quality based limits are shown on Pages 1-9 of this report.

Rationale Attachments- Section 4

WLAs And Supporting Documentation (Diffuser Manual, CBOD5 Calculations)

Diffuser | Shoreline Sulfate Chloride pH WLA

September 9, 2010

NPDES # 6-57-15-0-01

City of Cedar Rapids

(Please do not microfiche this document.)

This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Rapids, City of — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
	ADW = 43.77 mgd AWW = 56.00 mgd				
Diffuser Discharge					
pH (min-max)	6.0 to 14.0 Standard Units				--
Chloride*	1,851	2,758	864,491	1,288,256	1/month
Sulfate*	6,707	6,707	3,132,427	3,132,427	1/month
Shoreline Discharge					
pH (min-max)	6.5 to 9.2 Standard Units				--
Chloride*	695	695	324,779	324,779	1/month
Sulfate*	1,676	1,676	782,752	782,752	1/month

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH and previously carried an HQR designation 2.35 miles downstream from the discharge)

Date Done: September 9, 2010

Annual critical low flows in the Cedar River at the discharge point:
30Q10 flow 400 cfs, 7Q10 flow 349 cfs, 1Q10 flow 303 cfs, Harmonic mean flow 1,567 cfs

Excel Spreadsheet Calculations [ ] Qual II E Model [ ] Qual II E Modeling Date [ ]

Performed By: John Warren Approved By: Connie Dou

Comments

*The chloride/sulfate limits are based on the chloride/sulfate criteria that became effective on November 11, 2009. Chloride/sulfate criteria are hardness dependent and the default hardness has been changed from 100 mg/l to 200 mg/l, effective November 11, 2009.

Diffuser/Shoreline Sulfate Chloride pH WLA

September 9, 2010

WLA/Permit Limits for the City of Cedar Rapids' Mechanical Wastewater Treatment Facility

These wasteload allocations and water quality based permit limitations are for the City of Cedar Rapids' mechanical wastewater treatment facility. The wasteload allocations/permit limits are based on the Year 2006 revised Water Quality Standards and the "Supporting Document for Iowa Water Quality Management Plans, Chapter IV, June 16, 2004." The chloride and sulfate wasteload allocations/permit limits are based on the criteria that became effective on November 11, 2009.

1. BACKGROUND: The facility discharges into the Cedar River. Based on the Year 2006 revised water quality standards, the receiving segment of the Cedar River is designated as a Class A1, B(WW-1), HH waterbody. Approximately 2.35 miles downstream from the outfall, the river previously carried an HQR designation; however, a recent rule package for the Department's antidegradation policy removed this designation along with the HQ designation and has added new Outstanding Iowa Waters (OIW) and Outstanding National Resource Waters (ONRW) designations. The natural $30Q_{10}$ flow in the Cedar River at the discharge point is estimated to be 400 cfs, the $7Q_{10}$ flow is estimated to be 349 cfs and the $1Q_{10}$ flow is estimated to be 303 cfs based on flow statistics obtained at USGS gage station 05464500, located on the Cedar River at Cedar Rapids, IA. For informational purposes the harmonic mean flow was calculated to be 1,567 cfs.

The facility has a diffuser equipped outfall. The diffuser mixes with 80% of the river's natural flow. The facility also has a shoreline discharge outfall at the same location. Per request, limits for pH, chloride, and sulfate for both the diffuser discharge and the shoreline discharge were calculated.

2. CALCULATIONS: The wasteload allocations/permit limits for this outfall were calculated based on the facility's Average Dry Weather (ADW) design flow of 43.77 mgd and its Average Wet Weather (AWW) design flow of 56.00 mgd. Please note that only wasteload allocations/permit limits (water quality based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality based concentration permit limits were derived using the allowed stream flow and the ADW design flow, while loading limits were derived using the allowed concentration levels and the AWW design flow. The City has demonstrated that the AWW only occurs during elevated river conditions.

pH:
Iowa's Water Quality Standards (IAC 567-61.3(3)a(2) and IAC 567-61.3(3)b(2)) require that pH in Class A or Class B waters, "Shall not be less than 6.5 nor greater than 9.0." The criteria apply at the end of the ZID. For the diffuser discharge, the ZID is 80% of the annual critical 1Q10 flow in the Cedar River. For the shoreline discharge, the ZID is 2.5% of the annual critical 1Q10 flow in the Cedar River.

Chloride and Sulfate:
The chloride and sulfate criteria became effective on November 11, 2009. The default hardness value for background and effluent concentrations has been changed from 100 mg/l to 200 mg/l, effective on November 11, 2009.

Chloride criteria are functions of hardness and sulfate concentrations, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$

By: John Warren

The criteria apply to all Class B waters.

Sulfate criteria, shown in Table 1, are functions of hardness and chloride concentrations.

Table 1:
Sulfate Criteria

Hardness (mg/l as CaCO3)	Sulfate Criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The criteria defined in Table 1 serve as both acute and chronic criteria and apply to all Class B waters.

The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. For the diffuser discharge, 80% of the 7Q10 flow and 80% of the 1Q10 flow in the Cedar River were used as the MZ and ZID, respectively. For the shoreline discharge, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in the Cedar River were used as the MZ and ZID, respectively.

The default chloride and sulfate concentrations for both background water and effluent are 34 and 63 mg/l, respectively. Since the facility did not provide any site-specific hardness and ion concentration data, the default hardness, chloride, and sulfate values listed in Table 2 were used in the calculation as both the background and effluent values.

Table 2:
Default Hardness and Ion Concentrations

	Hardness (mg/l, as CaCO3)	Chloride (mg/l)	Sulfate (mg/l)
Background	200	34	63
Effluent	200	34	63

TDS:
Effective November 11, 2009, the site-specific TDS approach is no longer applicable; instead, the chloride and sulfate criteria became effective. The TDS concentration should be controlled to a level such that the narrative criteria stated in IAC 567-61.3(2) be fulfilled.

4. ANTIDEGRADATION REVIEW: According to the "Iowa Antidegradation Implementation Procedure," effective February 17, 2010 (IAC 567-61.2(2)e), all new or expanded regulated activities (with limited exceptions, such as unsewered communities) are subject to antidegradation review requirements. This policy has been adopted into State rule and is waiting on EPA approval. Prior to EPA approval, a Tier 2 review may be required on a case-by-case basis. Please note that the chloride and sulfate criteria are new standards for which the discharge has never been limited. Adding these limits to the NPDES permit would not be considered degradation because there is no change or increase of the pollutants in the discharge.

5. PERMIT LIMITATIONS: The wasteload allocations/permit limits are based on the Year 2006 revised Water Quality Standards and the 2007 chemical criteria. The chloride and sulfate wasteload allocations/permit limits are based on the criteria that became effective on November 11, 2009. Under the 2002 permit derivation procedure only for toxic parameters are the monitoring frequencies considered in the calculation of final limits. The water quality based limits can be found on page 1 this report.

Shoreline/diffuser PH/00 WLA

April 2, 2009

NPDES # 6- 57-15-0-01

City of Cedar Rapids

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This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI. WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Cedar Rapids, City of STP — Sewage File Number: 6-57-15-0-01

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Sampling Frequency
	ADW =43.77 mgd AWW =56.00 mgd				
Diffuser Discharge					
pH	6.0-14 standard units				
Shoreline Discharge					
pH	6.5-9.2 standard units				
CBOD5/Total D.O.	Compliance with CBOD5 limit of 20 lbs/day/cfs will not violate DO WQS				--

Stream Network/Classification of Receiving Stream: Cedar River (A1, B(WW-1), HH and HQR)

Date Done: April 2, 2009

Annual critical low flow in Cedar River at the discharge point
30Q10 flow 400 cfs, 7Q10 flow 349 cfs, 1Q10 flow 303 cfs

Excel Spreadsheet calculations [ ] Qual II E Model [ ] Qual II E Modeling date[ ]

Performed by: Xiaojian Gao & Connie Dou Approved By: Connie Dou

Shoreline/diffuser pH/DO WLA

April 2, 2009

WLA/permit limits for the City of Cedar Rapids' Mechanical Wastewater Treatment Facility

These wasteload allocations and water quality based permit limitations are for the City of Cedar Rapids' mechanical wastewater treatment facility. The wasteload allocations/permit limits are based on the Year 2006 revised Water Quality Standards and the "Supporting Document for Iowa Water Quality Management Plans, Chapter IV, June 16, 2004."

1. BACKGROUND: The facility discharges into Cedar River. Based on the Year 2006 revised water quality standards, the receiving segment of the Cedar River is a A1, B(WW-1), HH waterbody. Approximately 2.35 miles downstream from the outfall, the River is designated as A1, B(WW-1), HH and HQR. The natural $30Q_{10}$ flow in the Cedar River at the discharge point is estimated to be 400 cfs, the $7Q_{10}$ flow 349 cfs and the $1Q_{10}$ 303 cfs based on the statistic data obtained at USGS gage #05464500, located at Cedar Rapids, IA

The facility has a diffuser equipped outfall. The diffuser entrains 80% of the river's natural flow. The facility also has a shoreline discharge outfall at the same location. Per request, this WLA is to calculate pH limits for both the diffuser outfall and the shoreline discharge outfall. The total dissolved oxygen limit for the shoreline discharge outfall is also calculated.

2. CALCULATIONS: The wasteload allocations / permit limits for this outfall were calculated based on the facility's Average Dry Weather (ADW) design flow of 43.77 mgd and its Average Wet Weather (AWW) design flow of 56.00 mgd.

pH: Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the ZID.

For the diffuser discharge, the ZID is 80% of the annual critical 1Q10 flow in the Cedar River, the calculated limits for pH is between 6.0-14 standard units.

For the shoreline discharge, the ZID is 2.5% of the annual critical 1Q10 flow in the Cedar River, the calculated limits for pH is between 6.5-9.2 standard units.

Total Dissolved Oxygen: Per request, the limit for DO is for the shoreline discharge only.

The water quality standard for DO (in Class (B) streams) is that the DO level in the waterbody cannot be below 5 mg/l.

The DO level in the stream is affected by several factors, such as the re-aeration rate, the oxygen consuming components in the stream (BOD, ammonia, etc.). Streeter-Phelps DO Sag Model was used to simulate the decay of CBOD5 and ammonia and the dispersion of total Dissolved Oxygen (DO) in the receiving water downstream from the outfall. The simulation was conducted at low river flow conditions and using ADW as the discharge flow. As indicated in the September 3, 2008 WLA, the City has demonstrated that the AWW only occurs during elevated river conditions. Therefore, using low flow condition and ADW flow as the discharge flow is a reasonable conservative approach.

In order to get an accurate simulation, the key is to get the most accurate site-specific parameter values used in the model. The estimate of the parameter values are documented as follows:

1. River slope: 0.0004575, the slope is estimated using the USGS 7.5 minute map (the river channel descends 10 feet over a distance of approximately 4.14 miles) and a GIS coverage.

2. Flow velocity in the Cedar River around the discharge point: 0.84 fps, the velocity is estimated using the field measurement data collected by USGS.

3. Background pollutants concentration:
   Statewide average concentrations were used.
   CBOD5 : 8 mg/l
   Ammonia nitrogen: 0.5 mg/l (July and August) and 0.0 mg/l (remainder 10 months)
   DO: 6 mg/l
   Temperature: the monthly average river temperatures are shown in Table 1

Table 1: Monthly Background Temperatures

Month	Temperature (°C)	
	River Background	Effluent from Activated Sludge
Jan.	0.6	12.4
Feb.	1.2	11.3
March	4.3	13.1
April	11.7	16.2
May	16.6	19.3
June	21.4	22.1
July	24.8	24.1
August	23.8	24.4
Sept.	22.2	22.8
October	12.3	20.2
November	6	17.1
December	1.6	14.1

4. Pollutants concentration in the effluents
   Temperature: the average effluent temperatures from activated sludge are also listed in Table 1.

   CBOD5: The September 3, 2008 WLA allows 20 lbs/day/cfs as both the average and maximum limits. Using the 20 lbs/day/cfs limit, at low flow conditions (7Q10 = 349 cfs) and assumed discharge flow of ADW (43.77 mgd), the allowed maximum CBOD5 is 23 mg/l.

5. River re-aeration model
   The Owens et al. was used as the re-aeration model since the river depth is about 1.1 feet and velocity is about 0.84 fps that fall within the range for the recommended Owen et al. re-aeration model.

Using the parameter values that are listed above, the Streeter-Phelps DO Sag Modeling shows that compliance with the 20 lbs/day/cfs CBOD5 limits will ensure the DO level in the receiving River above 5.0 mg/l without effluent DO limitation.

7/8/09 Dou Email

Cswercko, Courtney [DNR]

From: Dou, Connie [DNR]
Sent: Wednesday, July 08, 2009 4:23 PM
To: Cswercko, Courtney [DNR]
Subject: RE: Cedar Rapids WLA request - DO for shoreline and pH for diffuser & shoreline
Attachments: Cedar Rapids 2008 writeup Diffuser_HQR.doc; WLA Request-OutPut2008 Diffuser.doc

Courtney,

The attached WLA for diffuser scenario includes the CBOD limits of 20 lbs/day/cfs and states that the CBOD will not violate the DO standard.

Connie
E-mail: connie.dou@dnr.iowa.gov
Telephone: (515)281-3350

From: Cswercko, Courtney [DNR]
Sent: Monday, July 06, 2009 12:59 PM
To: Dou, Connie [DNR]
Subject: RE: Cedar Rapids WLA request - DO for shoreline and pH for diffuser & shoreline

I do have a question concerning this WLA. I think I asked you this already, but I cannot find any documentation.

In the 4/2/09 WLA for Cedar Rapids, it states for the shoreline discharge that compliance with the CBOD limit of 20 lbs/day/cfs will not violate the DO WQS. Is this true for the diffuser discharge as well? Can you answer this without a DO WLA request for the diffuser outfall, or would you like me to make a new WLA request for DO for the diffuser outfall? Please let me know, thanks!

Courtney Cswercko, ESS, NPDES Section
Iowa Department of Natural Resources
502 E 9th Street, Des Moines, IA 50319-0034
phone 515-281-7206 fax 515-281-8895

From: Dou, Connie [DNR]
Sent: Monday, April 06, 2009 11:17 AM
To: Cswercko, Courtney [DNR]
Subject: RE: Cedar Rapids WLA request - DO for shoreline and pH for diffuser & shoreline

Hi Courtney,

Please see the attached WLA for Cedar Rapids. Please let us know if you have any questions.

Connie
E-mail: connie.dou@dnr.iowa.gov
Telephone: (515)281-3350

From: Cswercko, Courtney [DNR]
Sent: Wednesday, April 01, 2009 10:42 AM
To: Dou, Connie [DNR]
Subject: Cedar Rapids WLA request - DO for shoreline and pH for diffuser & shoreline

Diffuser WLA 9/9/08 revised 10/13/10

September 5, 2008

WLA/Water Quality-Based permit limits for the City of Cedar Rapids

(For diffuser and HQR consideration)

These wasteload allocations and water quality-based permit limitations are for the City of Cedar Rapids' activated sludge facility. The Cedar Rapids facility uses a diffuser entraining 80% of the river's natural flow. These wasteload allocations/WQ-based permit limits are based on the 2000 ammonia WQS and the 2002 permit derivation procedure. The TDS wasteload allocation/permit limits are based on the site-specific approach that became effective on June 16, 2004. The wasteload allocations for metals are calculated based on the water quality criteria became effective on November 28, 2007.

1. BACKGROUND: The facility discharges into the Cedar River that is designated as a Class A1 Primary Contact Recreational Use and a Class B(WW-1) Significant Resource Warm Water stream. The natural $30Q_{10}$ flow in the Cedar River is estimated to be 400 cfs and the $7Q_{10}$ flow is estimated to be 349 cfs and the $1Q_{10}$ flow is estimated to be 303 cfs based on USGS gage #05464500 at Cedar Rapids.

2. CALCULATIONS: The wasteload allocations/permit limits for this outfall was calculated based on an Average Dry Weather (ADW) design flow of 43.77 mgd and an Average Wet Weather (AWW) design flow of 56 mgd.

The water quality-based concentration permit limits are derived using the allowed stream flow and the ADW design flow, while loading limits are derived using the allowed concentration levels and the AWW design flow. The City has demonstrated that the AWW only occurs during elevated river conditions.

Flow Variable Ammonia Limits:

The following calculations are based on the 80% diffuser in the Cedar River. The **Mixing Zone (MZ)** using 80 percent of the $30Q_{10}$ stream flow as the stream flow available for the mixing zone calculations and 80 percent of the $1Q_{10}$ stream flow as the stream flow available for the **Zone of Initial Dilution (ZID)** calculations.

The proposal is to establish a flow variable limit for ammonia, having both an Average and Maximum Limits. The flow variable limit will follow the approach used for other facilities where pound per day per cfs values are calculated. Because of the potentially wide range of effluent flows, the pounds per day per cfs (#/d/cfs) values should only reflect the available stream flow capacity, not stream flow and effluent flow. Thus the following limits are based on the acute and chronic instream ammonia criteria (less any background ammonia concentration) converted to #/d/cfs. (Calculated by: (WQS - Background Concentration)*8.34*0.646*(MZ or ZID percentage) = Mass/Stream Flow Capacity). The Mass/Stream Flow capacity was converted to Average and Maximum permit limits using the current permit derivation procedure.

The facility will need to calculate, at the frequency specified in the permit, the Mass/Stream Flow for each day by:

$$\frac{Q_D \; C_D \; 8.34}{Q_R} = \text{Flow Variable Value (\#/d / cfs)}$$

where: Q_R = River Flow, cfs
Q_D = Discharge Flow, mgd
C_D = Discharge Ammonia Concentration, mg/l

It is important to note that the Discharge Monitoring Reports (DMR) will treat the Mass/Stream Flow as any other parameter. The monthly average and the daily maximum values will be included in the DMR. Compliance will be achieved when the monthly average and daily maximum are less than or equal to the permit limits noted in Table 3b. The DMR will need to record river flow (in cfs) at the same frequency as the ammonia monitoring along with the WWTP discharge flow, and ammonia concentrations to facilitate checking the results of this equation. The river flow can be obtained from an upstream USGS gage.

The loading rate equation has been simplified at the request of permit staff. The simplified flow-variable NH3-N limits remove the assimilative capacity of the effluent itself while previous WLAs allowed the CRWPCF to utilize the assimilative capacity of the effluent in their loading rate equation.

Since the Cedar River is designated as Class B(WW-1), the Early Life Stage ammonia criteria will begin in March and last through September.

The monthly background temperatures, pH and NH3-N concentrations shown in Table 1 were used for the wasteload allocation/permit limits calculations using the Year 2000 ammonia criteria.

Table 1
Background Temperature, pH and NH3-N Concentrations
For Use with Year 2000 Ammonia Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
Jan.	7.8	0.6	0.5
Feb.	7.7	1.2	0.5
March	7.9	4.3	0.5
April	8.1	11.7	0.5
May	8.1	16.6	0.5
June	8.1	21.4	0.5
July	8.1	24.8	0.0
August	8.2	23.8	0.0
Sept.	8	22.2	0.5
October	8	12.3	0.5
November	8.1	6	0.5
December	8	1.6	0.5

Table 2 shows the statewide monthly effluent pH and temperature values for a mechanical facility.

Table 2
Effluent pH & Temperature Values
for a mechanical facility

Months	pH	Temperature (°C)
Jan.	7.67	12.4
Feb.	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.7	22.1
July	7.58	24.1
August	7.63	24.4
Sept.	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

CBOD5: The average and maximum permit limits are 20 #/d/cfs, which is established based on the hand calculation approach of a conservative assimilation rate of CBOD5 (20 lbs/d/cfs) which has been derived from past modeling

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results that consistent with the wasteload procedure described in the "Supporting Document For Iowa Water Quality Management Plans, Chapter IV, June 16, 2004."

E Coli: The Cedar River is designated as Class A1 – Primary Contact Recreational Use. Thus, the effluent limits for E coli are geometric mean of 126-organisms/100 ml and a sample maximum of 235-organisms/100 ml from March 15th through November 15th.

Total Residual Chlorine and Toxics: The TRC and Toxics wasteload allocation will consider the procedures included in the 2000 revised WQS. Important to TRC and Toxics is the use of the $1Q_{10}$ stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the $7Q_{10}$ stream flow in its calculations. **The same percentages of mixing zone and zone of initial dilution were used for ADW and AWW; 80% for chronic WLA and 80% for acute WLA.** The newly calculated TRC limits take into account for the TRC decay of 0.3 mg/l in the mixing zone and the zone of initial dilution.

TDS:
The new site-specific TDS standard was adopted on June 16, 2004. The site-specific TDS approach would first consider a guideline value of 1,000 mg/l as a threshold in-stream level at which negative impacts to the uses of the receiving stream may begin to occur. Sources of TDS potentially elevating a receiving stream above 1,000 mg/l (TDS) would be required, upon application for a discharge permit or permit renewal, to clearly demonstrate that their discharge will not result in toxicity to the receiving stream. The guideline value applies to both the Zone of Initial Dilution (ZID) and the Mixing Zone (MZ) for designated streams. Using 80% of the 7Q10 flow and 80% of the 1Q10 flow in the Cedar River as the MZ and the ZID, respectively, the allowed effluent TDS concentration to meet the 1,000 mg/l of TDS threshold value at the boundary of the ZID is 3,506 mg/l and the allowed effluent TDS concentration to meet the 1,000 mg/l threshold value at the boundary of the MZ is 3,886 mg/l. If the effluent TDS levels are greater than 3,506 mg/l, an acute WET is required and if greater than 3,886 mg/l, a chronic WET test is required. The background TDS concentration is assumed as 300 mg/l.

Chloride:
Chloride is a constituent of TDS. At higher levels, chloride could cause toxicity to aquatic life. Thus, the WLA_{acute} and $WLA_{chronic}$ are calculated to evaluate the potential negative impacts. The acute and chronic threshold values for chloride for aquatic life protection are 860 mg/l and 230 mg/l, respectively. Since the receiving stream, the Cedar River is a designated stream, it is afforded protection against both acutely and chronically toxic conditions. Using 80% of the 7Q10 flow and 80% of the 1Q10 flow in the Cedar River as the MZ and the ZID, respectively, the allowed effluent chloride concentration to meet the 860 mg/l of chloride threshold value at the boundary of the ZID is 3,831 mg/l and the allowed effluent chloride concentration to meet the 230 mg/l threshold value at the boundary of the MZ is 1,055 mg/l. If the effluent chloride level is greater than 3,831 mg/l, an acute WET is required and if greater than 1,055 mg/l, a chronic WET test is required. The background chloride concentration is assumed as 30 mg/l.

Antidegradation review:

NH3-N: Because of the water quality standard revision for ammonia in 2000 and the revision of the 2002 permit derivation procedure, there is an increase for ammonia flow variable limits for certain months comparing with the current permit issued in May of 1997. As a result of the revision, the current seasonal limits are replaced with monthly limits for ammonia. Also, ammonia water quality standard adopted in 2000 results more stringent chronic criteria for warmer months (when sensitive early life fish species are present) and less stringent chronic criteria during colder months. As a result, the monthly average ammonia limits from June through September are more stringent than the current average limits. For the rest of the months, the monthly average ammonia limits are less stringent than the current average limits. The newly calculated maximum daily limits are less stringent than the current values for all the months.

Even though these newly calculated ammonia limits are based on the current WQS and should be protective of the designated uses of Class B(WW-1) and A1 in the Cedar River, about 2.35 miles (about 12, 444 feet) downstream from the outfall, the Cedar River is classified as Class HQR (High Quality Resource Water).

Iowa Administrative Code 61.2(2) describes the current antidegradation policy for Iowa's waters. 567 IAC 61.2(2) f - Physical and biological integrity: The waters designated as high-quality resource waters in 61.3(5)"e" will receive protection of existing uses through maintaining water quality levels necessary to fully protect existing uses or improve water quality to levels necessary to meet the designated use criterion in Tables 1, 2 and 3 and at preserving or enhancing the physical and biological integrity of these waters. This involves the protection of such features of the water body as channel alignment, bed characteristics, water velocity, aquatic habitat, and the type, distribution and abundance of existing aquatic species. 567 IAC 61.2(2) g - It is the intent of the antidegradation policy to protect and maintain the existing physical, biological, and chemical integrity of all waters of the state.

To fulfill the antidegradation review, the newly calculated ammonia limits are compared with the current ammonia limits. The more stringent of the two limits are selected as the final ammonia nitrogen limits. Both the current and the newly calculated ammonia limits are flow variable limits, which are expressed as lb/day per cfs of stream flow. However, the formulas for checking compliance are different. They are shown as below:

a. Current ammonia limits

The calculated monthly average value and daily maximum value can not exceed the average or maximum #/d/cfs limits in Table 2a

$$\frac{Q_D\,(8.34)(C_D - 1.26)}{Q_R}$$ **(1) NH3-N** Summer

$$\frac{Q_D\,(8.34)(C_D - 3.18)}{Q_R}$$ **(2) NH3-N** Winter

$$\frac{Q_D\,(8.34)(C_D - 1.55)}{Q_R}$$ **(3) NH3-N** Spring/Fall

$$\frac{Q_D\,(8.34)(C_D - 3.7)}{Q_R}$$ **(4) $CBOD_5$**

Where: Q_D is the daily effluent flow, mgd,
C_D is the daily effluent concentration, mg/l,
Q_R is the daily river flow, cfs,

For the purpose of these permit limitations, the Ammonia-N seasons are defined as:

Summer	- July and August
Winter	- January and February
Spring/Fall	- March through June
	- September through December

Table 2a
Water Quality Based Permit Limits
Flow Variable Ammonia Limits – Current Permit Limits
(Revised from shoreline limits to limits with diffuser 80% on Oct. 13, 2010)

Parameters	Mass/Stream Flow Average #/d/cfs	Mass/Stream Flow Maximum #/d/cfs	Sample Freq. #/mo.
Ammonia - N			
Summer	5.5	7.7	30
Winter	11.5	16.3	30
Spring/Fall	4.5	6.4	30
$CBOD_5$	20	28	30

Units are pound of ammonia nitrogen per day per each cubic foot of stream flow.

b. Newly Calculated Ammonia Limits

The calculated monthly average value and daily maximum value can not exceed the average or maximum #/d/cfs limits in Table 2b.

Daily Loading Rate:

$$\frac{(Q_D)(8.34)(C_D)}{Q_R}$$ **(1) NH3-N** For Each Month

Where: Q_D is the daily effluent flow, mgd,
C_D is the daily effluent concentration, mg/l,
Q_R is the daily creek flow, cfs,

Table 2b. Water Quality Based Permit Limits: Flow Variable Ammonia/ Limits For the Class B(WW-1)

Parameters	Protecting the A1,B(WW) Designated Use	
	Mass/Stream Flow Average #//d/cfs	Mass/Stream Flow Maximum #//d/cfs
Ammonia – N/		
Jan.	20.1	53.2
Feb.	22.9	59.9
March	9.9	46.1
April	6.9	37.3
May	5.7	36.7
June	3.6	35.7
July	4.7	41.9
August	4.2	36.4
Sep.	4.2	42.8
Oct.	9.9	41.8
Nov.	12.5	36.0
Dec.	14.9	42.1

Units are pound of ammonia nitrogen/ per day per each cubic foot of stream flow.

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The above flow variable mass limits are for protecting the designated use of Cedar River [Class A1,B(WW)].

The purpose of the antidegradation review is to protect the existing water quality in the HQR segment of the Cedar River. To that end, the ammonia concentration should have the same level at the beginning of the HQR based on the newly calculated ammonia limits and the current ammonia limits. Since the flow variable limits are calculated at different stream flow conditions, the stream velocity ranges from 0.75 fps to over 3 fps. At higher stream flow conditions, the time of travel from the outfall to the beginning of the HQR segment is less than 2 hours. Based on the short time of travel at higher stream flows, the ammonia decay is not accounted for from the outfall to the HQR. Thus, the target for the ammonia limits for the HQR is to result in the same ammonia concentration at the end of the mixing zone based on the average limits from both the newly calculated and the current ammonia discharge limits at all flow conditions; the same ammonia concentration at the end of Zone of Initial Dilution based on the daily maximum limits from both the newly calculated and the current ammonia discharge limits at all flow conditions. As a result, the ammonia limits are reduced from the newly calculated values shown in Table 2b for the protection of Class B(WW-1) for the Cedar River to the values shown in Table 2c for the protection of the existing water quality of the HQR segment.

Table 2c
Water Quality-based Flow Variable Permit Limits
For the City of Cedar Rapids (for HQR segment)

Pollutant	Average (lbs/d/cfs)	Maximum (lbs/d/cfs)
Ammonia- N/		
January	14.4	20.1
February	14.4	20.1
March	5.9	8.3
April	5.9	8.3
May	5.7	8.3
June	3.6	8.3
July	4.7	9.2
August	4.2	9.2
September	4.2	8.3
October	5.9	8.3
November	5.9	8.3
December	5.9	8.3
$CBOD_5$	20	20

TRC:

Table 2d lists the current and the newly calculated TRC limits based on 7Q10 and 1Q10 stream flows.

Table 2d
Water Quality-based Permit Limits
- Considering the Use of the Diffuser -

Pollutant	Average Conc. (mg/l)	Maximum Conc. (mg/l)	Average Loading (lbs/d)	Maximum Loading (lbs/d)	Monitoring Frequency (#/mo.)
Newly Calculated TRC limits					
TRC(when disinfecting)	0.28	0.39	129	181	12
Current TRC limits					

Total Residual Chlorine	0.10	0.15	48	68	30

The target for the antidegradation review is to have the same or lower TRC concentration at the beginning of the HQR segment based on both the current and newly calculated TRC discharge limits. The new TRC limits are calculated based on the newly adopted criteria on November 28, 2007, which are more stringent than the criteria used in the previous wasteload allocation. The newly calculated TRC limits are higher than the current TRC limits because the TRC default decay of 0.3 mg/l was adopted in the WQS that takes into account for the TRC decay in the Mixing Zone and the Zone of Initial Dilution. Thus, taking into account for the potential fast TRC decay in the mixing zone and the more stringent new numerical criteria for TRC, the new TRC limits will result in lower TRC concentration at the end of the mixing zone and the beginning of the HQR segment of the Cedar River.

Metals Limits: The water quality based limits for metals are based on the newly adopted criteria of November 28, 2007. The limits are calculated using the critical low flows of 7Q10 and 1Q10 flows in the Cedar River and the allowed Mixing Zone and Zone of Initial Dilution of 80% stream critical low flows for the diffuser.

Metals are usually conservative in nature. Thus, to meet the antidegradation requirement, the more stringent of the new limits and the current limits may be used as the final water quality limits to protect both the B(WW-1) designated use and the HQR segment of the Cedar River.

CBOD5:
The newly calculated CBOD5 limits are equally or more stringent than the current CBOD5 limits. No antidegradation review is required.

TDS and Chloride:
The water quality based limits for TDS/chloride are more stringent than the previous wasteload allocations, thus the antidegradation review requirement should be met.

3. PERMIT LIMITATIONS: - *Based on the Year 2000 Ammonia Water Quality Standards & 2002 Permit Derivation Procedure.*

The ammonia acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, the calculation of Water Quality-based ammonia limits does not consider the effluent sampling frequency. Only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The following tables show the water quality-based permit limits for the City of Cedar Rapids.

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Table 3
Water Quality-based Flow Variable Permit Limits
For the City of Cedar Rapids (for HQR segment)

Pollutant	Average (lbs/d/cfs)	Maximum (lbs/d/cfs)
Ammonia- N/		
January	14.4	20.1
February	14.4	20.1
March	5.9	8.3
April	5.9	8.3
May	5.7	8.3
June	3.6	8.3
July	4.7	9.2
August	4.2	9.2
September	4.2	8.3
October	5.9	8.3
November	5.9	8.3
December	5.9	8.3
$CBOD_5$	20	20

Table 4
Permit Limits for the City of Cedar Rapids
Considering the Use of the Diffuser – for the protection of Class B(WW-1)&HQR

Pollutant	Average Conc. (mg/l)	Maximum Conc. (mg/l)	Average Loading (lbs/d)	Maximum Loading (lbs/d)	Sampling Frequency
Toxics					
TRC(when disinfecting)	0.28	0.39	129	181	12/month
TDS	If TDS> 3,506 mg/l, acute WET test is required If TDS>3,886 mg/l, chronic WET test is required				
Chloride	If Chloride> 3,831 mg/l, acute WET test is required If Chloride>1,055mg/l, chronic WET test is required				
	If no WET testing is done, the following TDS limits apply				
TDS	3,506	3,506	1,381,798	1,381,798	

The metals and other toxics limits shown in Table 5 may be compared with the current metals limits to select the more stringent ones in order to protect the HQR segment downstream.

Table 5: Water Quality Based
Permit Limits for Cedar Rapids Mechanical Wastewater Treatment Facility*

Pollutant	Average Con. (mg/l)	Max. Con. (mg/l)	Ave. Loading (mg/l)	Max. Loading (mg/l)	Sampling frequency
Toxics					
1,1,1-Trichloroethane	120.91	120.91	5.647E+04	5.647E+04	1/week
1,1-Dichloroethylene	1.362E+02	2.473E+02	6.361E+04	1.155E+05	1/week
1,2-Dichloroethane	7.098E+00	2.702E+02	3.315E+03	1.262E+05	1/week
1,2-Dichloropropane	2.877E+00	2.877E+00	1.344E+03	1.344E+03	1/week
2,3,7,8-TCDD (Dioxin)	9.783E-10	9.783E-10	4.569E-07	4.569E-07	1/week
3,3-Dichlorobenzidine	5.371E-03	5.371E-03	2.509E+00	2.509E+00	1/week

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4,4' DDT	5.123E-06	5.038E-03	2.393E-03	2.353E+00	1/week
Aldrin	9.591E-06	1.374E-02	4.480E-03	6.417E+00	1/week
Aluminum	4.457E-01	3.435E+00	2.082E+02	1.604E+03	1/week
Antimony	3.279E+00	3.279E+00	1.531E+03	1.531E+03	1/week
Arsenic (III)	7.685E-01	1.557E+00	3.589E+02	7.273E+02	1/week
Benzene	9.783E+00	7.557E+01	4.569E+03	3.529E+04	1/week
Benzo(a)Pyrene	3.453E-03	3.453E-03	1.613E+00	1.613E+00	1/week
Bromoform	2.686E+01	2.686E+01	1.254E+04	1.254E+04	1/week
Cadmium	1.383E-03	9.755E-03	6.461E-01	4.556E+00	1/week
Carbon Tetrachloride	3.069E-01	9.870E+01	1.433E+02	4.609E+04	1/week
Chlordane	2.203E-05	1.099E-02	1.029E-02	5.134E+00	1/week
Chlorobenzene	8.197E+00	7.374E+01	3.828E+03	3.444E+04	1/week
Chlorodibromomethane	2.494E+00	2.494E+00	1.165E+03	1.165E+03	1/week
Chloroform	9.016E+01	9.016E+01	4.211E+04	4.211E+04	1/week
Chloropyrifos	2.101E-04	3.801E-04	9.810E-02	1.775E-01	1/week
Chromium (VI)	5.636E-02	7.328E-02	2.632E+01	3.422E+01	1/week
Copper	3.025E-02	4.901E-02	1.413E+01	2.289E+01	1/week
Cyanide	2.664E-02	1.008E-01	1.244E+01	4.706E+01	1/week
Di(2-ethylhexyl)phthalate	4.220E-01	4.220E-01	1.971E+02	1.971E+02	1/week
Dichlorobromomethane	3.261E+00	3.261E+00	1.523E+03	1.523E+03	1/week
Dieldrin	1.036E-05	1.099E-03	4.838E-03	5.134E-01	1/week

* The current water quality based limits may be governing for the protection of the HQR segment

Table 5: Water Quality Based
Permit Limits for Cedar Rapids Mechanical Wastewater Treatment Facility (Cont'd)*

Pollutant	Average Con. (mg/l)	Max. Con. (mg/l)	Ave. Loading (mg/l)	Max. Loading (mg/l)	Sampling frequency
Toxics					
Endosulfan	2.869E-04	1.008E-03	1.340E-01	4.706E-01	1/week
Endrin	1.844E-04	3.939E-04	8.614E-02	1.840E-01	1/week
Ethylbenzene	1.076E+01	1.037E+02	5.025E+03	4.845E+04	1/week
gamma-Hexachlorocyclohexane (Lindane)	4.351E-03	4.351E-03	2.032E+00	2.032E+00	1/week
Heptachlor	1.515E-05	2.382E-03	7.078E-03	1.112E+00	1/week
Heptachlor epoxide	7.481E-06	2.382E-03	3.494E-03	1.112E+00	1/week
Hexachlorobenzene	5.563E-05	5.563E-05	2.598E-02	2.598E-02	1/week
Hexachlorocyclopentadiene	5.636E+00	5.636E+00	2.632E+03	2.632E+03	1/week
Lead	1.639E-02	3.742E-01	7.657E+00	1.748E+02	1/week
Mercury (II)	7.685E-04	7.511E-03	3.589E-01	3.508E+00	1/week
Nickel	2.664E-01	2.153E+00	1.244E+02	1.005E+03	1/week
Nitrate as N	1.466E+03	1.466E+03	6.845E+05	6.845E+05	1/week
Nitrate+Nitrite as N	1.466E+03	1.466E+03	6.845E+05	6.845E+05	1/week
Nitrite as N	1.466E+03	1.466E+03	6.845E+05	6.845E+05	1/week
para-Dichlorobenzene	9.734E-01	9.160E+00	4.546E+02	4.278E+03	1/week
Parathion	6.660E-05	2.977E-04	3.111E-02	1.390E-01	1/week
Pentachlorophenol (PCP)	9.367E-02	2.967E-01	4.375E+01	1.386E+02	1/week
Phenols	2.562E-01	1.145E+01	1.196E+02	5.347E+03	1/week
Polychlorinated Biphenyls (PCBs)	1.228E-05	9.160E-03	5.734E-03	4.278E+00	1/week
Polynuclear Aromatic Hydrocarbons (PAHs)	1.537E-04	1.374E-01	7.178E-02	6.417E+01	1/week
Selenium (VI)	2.562E-02	8.839E-02	1.196E+01	4.128E+01	1/week
Silver	1.832E-02	1.832E-02	8.556E+00	8.556E+00	1/week
Tetrachloroethlyene	6.330E-01	6.330E-01	2.957E+02	2.957E+02	1/week

Thallium	2.408E-03	2.408E-03	1.125E+00	1.125E+00	1/week
Toluene	2.562E-01	1.145E+01	1.196E+02	5.347E+03	1/week
Toxaphene	1.025E-05	3.343E-03	4.786E-03	1.561E+00	1/week
trans-1,2-Dichloroethylene	7.173E-01	7.173E-01	3.350E+02	3.350E+02	1/week
Trichloroethylene (TCE)	4.099E-01	1.832E+01	1.914E+02	8.556E+03	1/week
Vinyl Chloride	4.604E-01	4.604E-01	2.150E+02	2.150E+02	1/week
Zinc	5.496E-01	5.496E-01	2.567E+02	2.567E+02	1/week

* The current water quality based limits may be governing for the protection of the HQR segment

TMDL Status for Cedar River: Cedar Rapid WWTP discharges below the impaired reach for nitrate, and is not impacted by the Cedar River nitrate TMDL. The WWTP does discharge to an impaired reach though, for bacteria. Since the end of pipe bacteria limits are imposed and the facility needs to disinfect to meet the bacteria limits, the future TMDL will not affect the limits for bacteria for this facility.

by Connie Dou
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Toxicity Testing
9/9/08

To: Cedar Rapids
No: *6-57-15-0-01*
From: Connie Dou
Date: 09/09/2008

Calculation of Dilution Percentages for Effluent Toxicity Testing

(1) Data for calculation of percentages:

ADW Flow (*Effluent flow*) = 43.77 mgd = 67.7122 cfs

$1Q_{10}$ = 303 cfs

%1Q10 in ZID (for toxics) = 2.5 %

***Stream flow in ZID = 7.575 cfs**

**calculated as: % 1Q10 for ZID for toxics(usually 2.5%) x 1Q10 (in cfs)*

---

(2) Equation for % Effluent (based on mixing zone study data for ZID):

$$\text{\% Effluent} = \frac{(\textit{Effluent Flow, cfs}) \times 100}{(\textit{Effluent Flow, cfs}) + (\textit{Stream Flow in ZID, cfs})}$$

$$\text{\% Effluent} = \frac{(67.7122\ \textit{cfs}) \times 100}{(67.7122\ \textit{cfs}) + (7.575\textit{cfs})}$$

% Effluent = 89.9%

(3) Equation for % Effluent (using diffuser):

$$\text{\% Effluent} = \frac{(\textit{Effluent Flow, cfs}) \times 100}{(\textit{Effluent Flow, cfs}) + (\textit{Stream Flow in ZID, cfs})}$$

$$\text{\% Effluent} = \frac{(67.7122\ \textit{cfs}) \times 100}{(67.7122\ \textit{cfs}) + (242.4\textit{cfs})}$$

% Effluent = 21.8%

The following are the percentages of effluent and dilution water to be specified in the NPDES permit's section addressing Effluent Toxicity Testing requirements

1. No diffuser:

89.9 **% Effluent**

10.1 **% Dilution Water** *(100% - % Effluent)*

2. Using Diffuser:

21.8 **% Effluent**

78.2 **% Dilution Water** *(100% - % Effluent)*

Shoreline WLA 9/9/08

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: City of Cedar Rapids (Shoreline Discharge) Sewage File Number: *6-57-15-0-01*

Parameters	Ave. Conc. (mg/l)	Max Conc. (mg/l)	Ave. Mass (lbs/d)	Max Mass (lbs/d)	Samples Per Month
Outfall No. 001	**ADW = 43.77 mgd AWW = 56 mgd**				
CBOD	See Table 3 in the write-up				
Ammonia-Nitrogen	See Table 3 in the write-up				
January					--
February					--
March					--
April					--
May					--
June					--
July					--
August					--
September					--
October					--
November					--
December					--
TRC					
Toxics	See Table 5 in the write-up				
Bacteria	**Geomean (#Org./100ml)**	**Sample Max (#Org./100ml)**			
E. Coli	126	235	March 15 – Nov. 15		
TDS	If TDS> 1,078mg/l, acute WET test is required If TDS>1,902 mg/l, chronic WET test is required				
Chloride	If Chloride> 953 mg/l, acute WET test is required If Chloride>488 mg/l, chronic WET test is required				
	If no WET tests are done, the following limits apply				
TDS	1,078	1,078	495,626	495,626	1/ month

Stream Network/Classification of Receiving Stream: the Cedar River (B(WW-1), Class A1 and HH) Date Done: 9-09-2008

Annual critical low flow in the Des Moines River at the discharge point
30Q10 flow 400 cfs, 7Q10 flow 349 cfs, 1Q10 flow 303 cfs

Excel Spreadsheet calculations [ ] Qual II E Model [ ] Qual II E Modeling date[ ]
Performed by: Connie Dou Approved By: Connie Dou

For TDS and Chloride WET tests:

For the acute WET test, use 89.9% effluent and 10.1% dilution water
For the chronic WET test, use 43.7% effluent and 56.3% dilution water

For WET test required for all major facilities, use 89.9% effluent and 10.1% dilution water. Only acute WET test is required.

Shoreline WLA 9/9/08

September 9, 2008

WLA/Water Quality-Based permit limits for the City of Cedar Rapids

(For Shoreline and HQR consideration)

These wasteload allocations and water quality-based permit limitations are for the City of Cedar Rapids' activated sludge facility. The Cedar Rapids facility uses a diffuser entraining 80% of the river's natural flow. However, this wasteload allocation is calculated for shoreline discharge only. These wasteload allocations/WQ-based permit limits are based on the 2000 ammonia WQS and the 2002 permit derivation procedure. The TDS wasteload allocation/permit limits are based on the site-specific approach that became effective on June 16, 2004. The wasteload allocations for metals are calculated based on the water quality criteria became effective on November 28, 2007.

1. BACKGROUND: The facility discharges into the Cedar River that is designated as a Class A1 Primary Contact Recreational Use and a Class B(WW-1) Significant Resource Warm Water stream. The natural $30Q_{10}$ flow in the Cedar River is estimated to be 400 cfs and the $7Q_{10}$ flow is estimated to be 349 cfs and the $1Q_{10}$ flow is estimated to be 303 cfs based on USGS gage #05464500 at Cedar Rapids.

2. CALCULATIONS: The wasteload allocations/permit limits for this outfall was calculated based on an Average Dry Weather (ADW) design flow of 43.77 mgd and an Average Wet Weather (AWW) design flow of 56 mgd.

The water quality-based concentration permit limits are derived using the allowed stream flow and the ADW design flow, while loading limits are derived using the allowed concentration levels and the AWW design flow. The City has demonstrated that the AWW only occurs during elevated river conditions.

Flow Variable Ammonia Limits:

The following calculations are based on the default mixing zone and zone of initial dilution of a shoreline discharge in the Cedar River. The **Mixing Zone (MZ)** using a default mixing zone 25% of the $30Q_{10}$ stream flow as the stream flow available for the mixing zone calculations and 2.5 percent of the $1Q_{10}$ stream flow as the stream flow available for the **Zone of Initial Dilution (ZID)** calculations.

The proposal is to establish a flow variable limit for ammonia, having both an Average and Maximum Limits. The flow variable limit will follow the approach used for other facilities where pound per day per cfs values are calculated. Because of the potentially wide range of effluent flows, the pounds per day per cfs (#/d/cfs) values should only reflect the available stream flow capacity, not stream flow and effluent flow. Thus the following limits are based on the acute and chronic instream ammonia criteria (less any background ammonia concentration) converted to #/d/cfs. (Calculated by: (WQS - Background Concentration)*8.34*0.646*(MZ or ZID percentage) = Mass/Stream Flow Capacity). The Mass/Stream Flow capacity was converted to Average and Maximum permit limits using the current permit derivation procedure.

The facility will need to calculate, at the frequency specified in the permit, the Mass/Stream Flow for each day by:

$$\frac{Q_D \; C_D \; 8.34}{Q_R} = \text{Flow Variable Value (\#/d / cfs)}$$

where: Q_R = River Flow, cfs
Q_D = Discharge Flow, mgd
C_D = Discharge Ammonia Concentration, mg/l

It is important to note that the Discharge Monitoring Reports (DMR) will treat the Mass/Stream Flow as any other parameter. The monthly average and the daily maximum values will be included in the DMR. Compliance will be achieved when the monthly average and daily maximum are less than or equal to the permit limits noted in Table 3b. The DMR will need to record river flow (in cfs) at the same frequency as the ammonia monitoring along with the WWTP discharge flow, and ammonia concentrations to facilitate checking the results of this equation. The river flow can be obtained from an upstream USGS gage.

The loading rate equation has been simplified at the request of permit staff. The simplified flow-variable NH3-N limits remove the assimilative capacity of the effluent itself while previous WLAs allowed the CRWPCF to utilize the assimilative capacity of the effluent in their loading rate equation.

Since the Cedar River is designated as Class B(WW-1), the Early Life Stage ammonia criteria will begin in March and last through September.

The monthly background temperatures, pH and NH3-N concentrations shown in Table 1 were used for the wasteload allocation/permit limits calculations using the Year 2000 ammonia criteria.

Table 1
Background Temperature, pH and NH3-N Concentrations
For Use with Year 2000 Ammonia Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
Jan.	7.8	0.6	0.5
Feb.	7.7	1.2	0.5
March	7.9	4.3	0.5
April	8.1	11.7	0.5
May	8.1	16.6	0.5
June	8.1	21.4	0.5
July	8.1	24.8	0.0
August	8.2	23.8	0.0
Sept.	8	22.2	0.5
October	8	12.3	0.5
November	8.1	6	0.5
December	8	1.6	0.5

Table 2 shows the statewide monthly effluent pH and temperature values for a mechanical facility.

Table 2
Effluent pH & Temperature Values
for a mechanical facility

Months	pH	Temperature (°C)
Jan.	7.67	12.4
Feb.	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.7	22.1
July	7.58	24.1
August	7.63	24.4
Sept.	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

The calculated monthly average value and daily maximum value can not exceed the average or maximum #/d/cfs limits in Table 2a.

Shoreline WLA 9/9/08

Daily Loading Rate:

$$\frac{(Q_D)(8.34)(C_D)}{Q_R}$$ **(1) NH3-N** For Each Month

Where: Q_D is the daily effluent flow, mgd,
C_D is the daily effluent concentration, mg/l,
Q_R is the daily creek flow, cfs,

Table 2a. Water Quality Based Permit Limits: Flow Variable Ammonia/ Limits For the Class B(WW-1)

Parameters	Protecting the A1,B(WW) Designated Use	
	Mass/Stream Flow Average #//d/cfs	Mass/Stream Flow Maximum #//d/cfs
Ammonia – N/		
Jan.	1.9	1.9
Feb.	1.8	1.8
March	1.9	1.9
April	1.9	1.9
May	1.8	1.9
June	1.1	1.8
July	1.5	2.3
August	1.3	2.1
Sep.	1.3	2.1
Oct.	2.0	2.0
Nov.	1.8	1.8
Dec.	2.0	2.0

Units are pound of ammonia nitrogen/ per day per each cubic foot of stream flow.

The above flow variable mass limits are for protecting the designated use of Cedar River [Class A1,B(WW)].

CBOD5: The average and maximum permit limits are 20 #/d/cfs, which is established based on the hand calculation approach of a conservative assimilation rate of CBOD5 (20 lbs/d/cfs) which has been derived from past modeling results that consistent with the wasteload procedure described in the "Supporting Document For Iowa Water Quality Management Plans, Chapter IV, June 16, 2004."

E Coli: The Cedar River is designated as Class A1 – Primary Contact Recreational Use. Thus, the effluent limits for E coli are geometric mean of 126-organisms/100 ml and a sample maximum of 235-organisms/100 ml from March 15th through November 15th.

Total Residual Chlorine and Toxics: The TRC and Toxics wasteload allocation will consider the procedures included in the 2000 revised WQS. Important to TRC and Toxics is the use of the $1Q_{10}$ stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the $7Q_{10}$ stream flow in its calculations. **The same percentages of mixing zone and zone of initial dilution were used for ADW and AWW; 25% for chronic WLA and 2.5% for acute WLA.** The newly calculated TRC limits take into account for the TRC decay of 0.3 mg/l in the mixing zone and the zone of initial dilution.

TDS:

The new site-specific TDS standard was adopted on June 16, 2004. The site-specific TDS approach would first consider a guideline value of 1,000 mg/l as a threshold in-stream level at which negative impacts to the uses of the receiving stream may begin to occur. Sources of TDS potentially elevating a receiving stream above 1,000 mg/l (TDS) would be required, upon application for a discharge permit or permit renewal, to clearly demonstrate that their discharge will not result in toxicity to the receiving stream. The guideline value applies to both the Zone of Initial Dilution (ZID) and the Mixing Zone (MZ) for designated streams. Using 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in the Cedar River as the MZ and the ZID, respectively, the allowed effluent TDS concentration to meet the 1,000 mg/l of TDS threshold value at the boundary of the ZID is 1,078 mg/l and the allowed effluent TDS concentration to meet the 1,000 mg/l threshold value at the boundary of the MZ is 1,902 mg/l. If the effluent TDS levels are greater than 1,078 mg/l, an acute WET is required and if greater than 1,902 mg/l, a chronic WET test is required. The background TDS concentration is assumed as 300 mg/l.

Chloride:
Chloride is a constituent of TDS. At higher levels, chloride could cause toxicity to aquatic life. Thus, the WLA_{acute} and $WLA_{chronic}$ are calculated to evaluate the potential negative impacts. The acute and chronic threshold values for chloride for aquatic life protection are 860 mg/l and 230 mg/l, respectively. Since the receiving stream, the Cedar River is a designated stream, it is afforded protection against both acutely and chronically toxic conditions. Using 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in the Cedar River as the MZ and the ZID, respectively, the allowed effluent chloride concentration to meet the 860 mg/l of chloride threshold value at the boundary of the ZID is 953 mg/l and the allowed effluent chloride concentration to meet the 230 mg/l threshold value at the boundary of the MZ is 488 mg/l. If the effluent chloride level is greater than 953 mg/l, an acute WET is required and if greater than 488 mg/l, a chronic WET test is required. The background chloride concentration is assumed as 30 mg/l.

Antidegradation review:

NH3-N: The shoreline flow variable ammonia limits are more stringent than the current limits.

TRC:

Table 2b lists the current and the newly calculated TRC limits based on 7Q10 and 1Q10 stream flows.

Table 2b
Water Quality-based Permit Limits
- Shoreline Discharge -

Pollutant	Average Conc. (mg/l)	Maximum Conc. (mg/l)	Average Loading (lbs/d)	Maximum Loading (lbs/d)	Monitoring Frequency (#/mo.)
Newly Calculated TRC limits					
TRC(when disinfecting)	0.25	0.32	118	150	12
Current TRC limits					
Total Residual Chlorine	0.10	0.15	48	68	30

The target for the antidegradation review is to have the same or lower TRC concentration at the beginning of the HQR segment based on both the current and newly calculated TRC discharge limits. The new TRC limits are calculated based on the newly adopted criteria on November 28, 2007, which are more stringent than the criteria used in the previous wasteload allocation. The newly calculated TRC limits are higher than the current TRC limits because the TRC default decay of 0.3 mg/l was adopted in the WQS that takes into account for the TRC decay in the Mixing Zone and the Zone of Initial Dilution. Thus, taking into account for the potential fast TRC decay in the mixing zone and the more stringent new numerical criteria for TRC, the new TRC limits will result in lower TRC concentration at the end of the mixing zone and the beginning of the HQR segment of the Cedar River.

Shoreline WTF 9/9/08

Metals Limits: The water quality based limits for metals are based on the newly adopted criteria of November 28, 2007. The limits are calculated using the critical low flows of 7Q10 and 1Q10 flows in the Cedar River and the allowed default Mixing Zone and Zone of Initial Dilution of 25% of 7Q10 flow and 2.5% 1Q10 flow, respectively.

Metals are usually conservative in nature. Thus, to meet the antidegradation requirement, the more stringent of the new limits and the current limits may be used as the final water quality limits to protect both the B(WW-1) designated use and the HQR segment of the Cedar River.

CBOD5:
The newly calculated CBOD5 limits are equally or more stringent than the current CBOD5 limits. No antidegradation review is required.

TDS and Chloride:
The water quality based limits for TDS/chloride are more stringent than the previous wasteload allocations, thus the antidegradation review requirement should be met.

3. PERMIT LIMITATIONS: - *Based on the Year 2000 Ammonia Water Quality Standards & 2002 Permit Derivation Procedure.*

The ammonia acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, the calculation of Water Quality-based ammonia limits does not consider the effluent sampling frequency. Only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The following tables show the water quality-based permit limits for the City of Cedar Rapids.

Table 3
Water Quality-based Flow Variable Permit Limits
For the City of Cedar Rapids (for HQR segment) – Shoreline Discharge

Pollutant	Average (lbs/d/cfs)	Maximum (lbs/d/cfs)
Ammonia- N/		
January	1.9	1.9
February	1.8	1.8
March	1.9	1.9
April	1.9	1.9
May	1.8	1.9
June	1.1	1.8
July	1.5	2.3
August	1.3	2.1
September	1.3	2.1
October	2.0	2.0
November	1.8	1.8
December	2.0	2.0
$CBOD_5$	20	20

Table 4
Permit Limits for the City of Cedar Rapids
Shoreline Discharge – for the protection of Class B(WW-1)&HQR

Pollutant	Average Conc. (mg/l)	Maximum Conc. (mg/l)	Average Loading (lbs/d)	Maximum Loading (lbs/d)	Sampling Frequency
Toxics					
TRC(when disinfecting)	0.25	0.32	118	150	12
TDS	If TDS> 1,078mg/l, acute WET test is required If TDS>1,902 mg/l, chronic WET test is required				
Chloride	If Chloride> 953 mg/l, acute WET test is required If Chloride>488 mg/l, chronic WET test is required				
	If no WET testing is done, the following TDS limits apply				
TDS	1,078	1,078	495,626	495,626	

The metals and other toxics limits shown in Table 5 may be compared with the current metals limits to select the more stringent ones in order to protect the HQR segment downstream.

Table 5: Water Quality Based
Permit Limits for Cedar Rapids Mechanical Wastewater Treatment Facility*

Pollutant	Average Con. (mg/l)	Max. Con. (mg/l)	Ave. Loading (mg/l)	Max. Loading (mg/l)	Sampling frequency
Toxics					
Cadmium	0.0006	0.0024	0.29	1.11	1/week
Chromium (VI)	0.0178	0.0178	8.31	8.31	1/week
Copper	0.0151	0.0151	7.05	7.05	1/week
Cyanide	0.0119	0.0245	5.56	11.42	1/week
Lead	0.0073	0.0908	3.42	42.43	1/week
Mercury (II)	0.0003	0.0018	0.16	0.85	1/week
Nickel	0.1190	0.5226	55.58	244.07	1/week
Selenium (VI)	0.0114	0.0215	5.34	10.02	1/week
Silver	0.0044	0.0044	2.08	2.08	1/week
Zinc	0.1334	0.1334	62.31	62.31	1/week

* The current water quality based limits may be governing for the protection of the HQR segment

TMDL Status for Cedar River: Cedar Rapid WWTP discharges below the impaired reach for nitrate, and is not impacted by the Cedar River nitrate TMDL. The WWTP does discharge to an impaired reach though, for bacteria. Since the end of pipe bacteria limits are imposed and the facility needs to disinfect to meet the bacteria limits, the future TMDL will not affect the limits for bacteria for this facility.

by Connie Dou
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Design CF Info

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
HENRY A. WALLACE BUILDING
DES MOINES, IOWA 50319

CONSTRUCTION PERMIT

City of Cedar Rapids
1201 6th Street SW
Cedar Rapids, IA 52404

PERMIT NO.: 95-133-S

FILE: Cedar Rapids - Sewerage

SUBJECT: Odor Control Improvements and Final Clarifier Additions

PROJECT NO.: S94-341

In accordance with the provisions of Sections 455B.173.3 and 455B.174.4 Code of Iowa, and Rule 567--64.2(455B) or Rule 567--65.6(455B), or Rule 567--43.3(455B) of the Iowa Administrative Code, the Director of the Department of Natural Resources does hereby issue a permit for the construction of:

A final effluent pumping installation, 30-inch force main and gravity return lines, three 140-feet diameter aluminum geodesic domes, seven aluminum ventilator fans, aluminum and polyethylene ductwork and controls, instrumentation, electrical work, two 172 feet diameter concrete clarifiers, piping with valves and flow meters in final lift station, and miscellaneous work and appurtenances to complete project in accordance with the approved plans and specifications.

The water pollution control facilities with the improvements and additions approved under this construction permit are designed to treat an organic loading of 240,000 pounds of BOD_5 per day while handling an average daily dry weather flow of 43.77 MGD, an average daily wet weather flow of 56.0 MGD and a maximum daily wet weather flow of 86.95 MGD.

This construction permit is issued subject to the following conditions and requirements:

1. The issuance of this construction permit for the proposed improvements and additions to the water pollution control facilities is conditioned on the basis that the City of Cedar Rapids shall obtain a new NPDES permit from this department for operation of the upgraded treatment facilities.
2. The construction required under this construction permit shall be scheduled so as to prevent or minimize any bypassing of inadequately treated wastewater. If such bypassing is required during construction, written permission must be obtained from this department prior to any bypassing in accordance with Rule 567--63.6(455B) of the Iowa Administrative Code. Please contact our field office at Manchester, Iowa to obtain such written permission.

The construction of the project shall be initiated within one year of issuance of this permit or this permit is no longer valid. Within thirty days after completion of construction, the permit holder shall submit a certification by a registered professional engineer that the project was completed in accordance with the approved project documents.

Pursuant to Section 455B.174.4, Code of Iowa, you have the right to appeal any condition of this permit by filing with the Director of the Department of Natural Resources a notice of appeal and request for administrative hearing within thirty days of receipt of this permit.

Contact Fred M. Evans at 515/281-8995 with any questions or comments.

For the Department of Natural Resources:

Larry J. Wilson, Director

By: Fred M. Evans
for Wayne Farrand
ENVIRONMENTAL PROTECTION DIVISION

Date: March 16, 1995

cc: Water Pollution Control Facilities, Cedar Rapids, IA
City Engineer, Cedar Rapids, IA
Howard R. Green Company, Cedar Rapids, IA
Field Office 1

(FME045.BP)

Plan Distribution

1 Engineer; 1 Field Office; 1 DNR File

IOWA DEPARTMENT OF WATER, AIR AND WASTE MANAGEMENT

WATER QUALITY PROGRAM

CONSTRUCTION PERMIT APPLICATION

SCHEDULE G, TREATMENT PROJECT DESIGN DATA

Schedule G

DATE PREPARED: 10-4-94

DATE REVISED:

PROJECT IDENTITY: Cedar Rapids WPCP Odor Control Improvements and Final Clarifier Additions

WAWM USE
PROJECT NO.
PERMIT NO.

1. Project Description: Addition of 3 roughing filter domes with odor scrubbing and C&D final clarifiers

2. Design Basis:

Plant Design Loading		Present ADW	Present AWW	Present MWW	Design Year (2015) ADW	Design Year (2015) AWW	Design Year (2015) MWW
Residential Waste	Population	135,000	////////////	////////////	160,000	////////////	////////////
	Flow, MGD	6.41	6.41	6.41	7.78	7.78	7.78
	BOD_5, #/day	20,000	20,000	20,000	24,000	24,000	24,000
	TKN, #/day	2,700	2,700	2,700	4,000	4,000	4,000
Out of Town Students	Number		////////	////////		////////	////////
	Flow, MGD						
	BOD_5, #/day						
	TKN, #/day						
Industrial	Flow, MGD	11.74	11.74	11.74	19.50	19.50	19.50
	Rated Flow, MGD						
	BOD_5, #/day	122,000	122,000	122,000	189,000	189,000	189,000
	TKN, #/day	6,200	6,200	6,200	12,000	12,000	12,000
Sm. Industry Other & (Specify) Commercial	Flow, MGD	7.91	7.91	7.91	9.43	9.43	9.43
	Rated Flow, MGD						
	BOD_5, #/day	18,000	18,000	18,000	27,000	27,000	27,000
	TKN, #/day	2,100	2,100	2,100	2,500	2,500	2,500
Infiltration	MGD	5.69	8.10	12.0	7.06	9.59	14.38
Inflow	MGD	0	14.84	38.24	0	9.70	35.86
Total	Flow, MGD	31.75	49.0	76.3	43.77	56.0	86.95
	Rated Flow, MGD						
	BOD_5, mg/l	604	392	251	657	514	331
	BOD_5, #/day	160,000	160,000	160,000	240,000	240,000	240,000
	TKN, mg/l	41.5	26.9	17.3	50.7	39.6	25.5
	TKN, #/day	11,000	11,000	11,000	18,500	18,500	18,500

3. Peak Hourly Dry Weather Flow 39.3 MGD + Peak Hourly Infiltration 15.8 MGD +/-Peak Hourly Inflow 39.4 MGD=Total Peak Hourly Wet Weather Flow 94.5 MGD (In Design Year)

4. Identify effluent limitations

		BOD_5 day Avg	BOD_5 day Max	Suspended Solids Avg	Suspended Solids Max	NH_3-N Avg	NH_3-N Max				
Operation Permit Effluent Limits	mg/l	25	40	30	45						
	#/day	11,676	18,682	14,011	21,017						
Design Effluent Quality	mg/l										
	#/day										

5. Identify significant industrial/commercial contributors:

Waste Contributors	Pre-treat	Operation Hrs/Day	Operation Days/Week	Design Loadings Flow MGD Total	Flow MGD Rated	BOD_5 #/day	Susp. Solids #/day	TKN #/day	Oil & Grease #/day	# /day

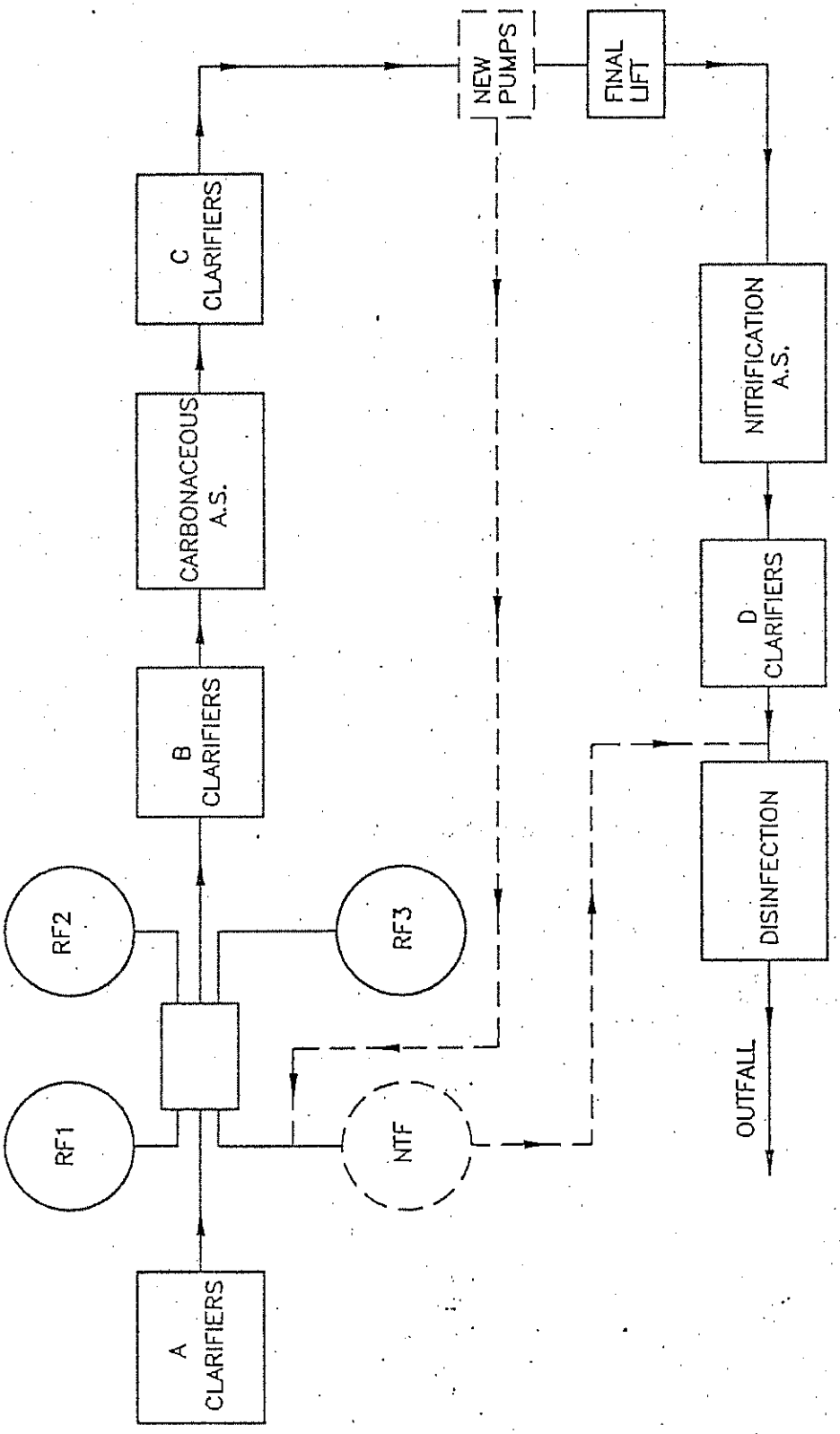
WAWM form 28-G (Jul 1, 83) (Replaces DEQ Form WQ 133-G, which may be used)

IOWA DEPARTMENT OF WATER, AIR AND WASTE MANAGEMENT

CONSTRUCTION PERMIT APPLICATION

SCHEDULE H1, SCHEMATIC FLOW DIAGRAM

WATER QUALITY PROGRAM		WAWM USE
DATE PREPARED 7-21-94	PROJECT IDENTITY Odor Control Improvements Water Pollution Control Facilities Cedar Rapids, Iowa	PROJECT NO.
DATE REVISED		PERMIT NO.



Diffuser Design 6-57-15-0-01 Cedar Rapids Sewage 1098

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
HENRY A. WALLACE BUILDING
DES MOINES, IOWA 50319

CONSTRUCTION PERMIT

Cedar Rapids WPC Facilities
7525 Otis Road
Cedar Rapids, Iowa 52403

PERMIT NO: 99-1-S
FILE: Cedar Rapids, Sewage
RE: River Diffuser & Utility Crossing
PROJECT NO: S97-448

In accordance with the provisions of Section 455B.173.9 and 455B.174.4, Code of Iowa, and Rule 567--64.2(455B) or Rule 567--65.5(455B), or Rule 567--41.12(455B) of the Iowa Administrative Code, the Director of the Department of Natural Resources does hereby issue a permit for the construction of:

---One 60-inch diameter reinforced concrete diffuser, 8 inch diffuser check valves, concrete diversion structure and other related items for one river diffuser. One utility crossing including one 24 inch ductile iron pipes for future use to convey industrial wastewater, one 15 inch PVC pipe and one 12 inch ductile iron pipe for future use to convey sanitary sewer flows.---

The issuance of this permit for the proposed wastewater treatment facilities is conditioned on the basis that the city of Cedar Rapids shall obtain a amended NPDES permit from this department for operation of this wastewater treatment facility to meet effluent limitations associated with this construction permit. The city must understand that the draft amended NPDES permit will be subject to public notice and comment. Operation under the amended NPDES permit cannot commence until the permit is issued as final.

The utility crossing pipes approved under this construction permit are for future uses. No service connections shall be made to the approved utility crossing pipes until such time as both upstream and down stream sewers are completed and connected to the municipal treatment system.

The construction of the project shall be initiated within one year of issuance of this permit or this permit is no longer valid. Within thirty days after completion of construction, the permit holder shall submit a certification by a registered professional engineer that the project was completed in accordance with the approved project documents.

Pursuant to Section 455B.174.4, Code of Iowa, you have the right to appeal any condition of this permit by filing with the Director of the Department of Natural Resources a notice of appeal and request for administrative hearing within thirty days of receipt of this permit.

Diffuser Design

Contact Billy Chen at 515/281-4305 with any questions or comments.

For the Department of Natural Resources
Larry J. Wilson, Director

By: _____
ENVIRONMENTAL PROTECTION DIVISION

Date: October 2, 1998

cc: H.R. Green - Cedar Rapids
Field Office No. 1

Plan Distribution

[1] Engineer; [1] Field Office; [1] DNR File

IOWA DEPARTMENT OF WATER, AIR AND WASTE MANAGEMENT

CONSTRUCTION PERMIT APPLICATION

SCHEDULE H1, SCHEMATIC FLOW DIAGRAM

Diffuser design

WATER QUALITY PROGRAM

DATE PREPARED 10-20-98

DATE REVISED

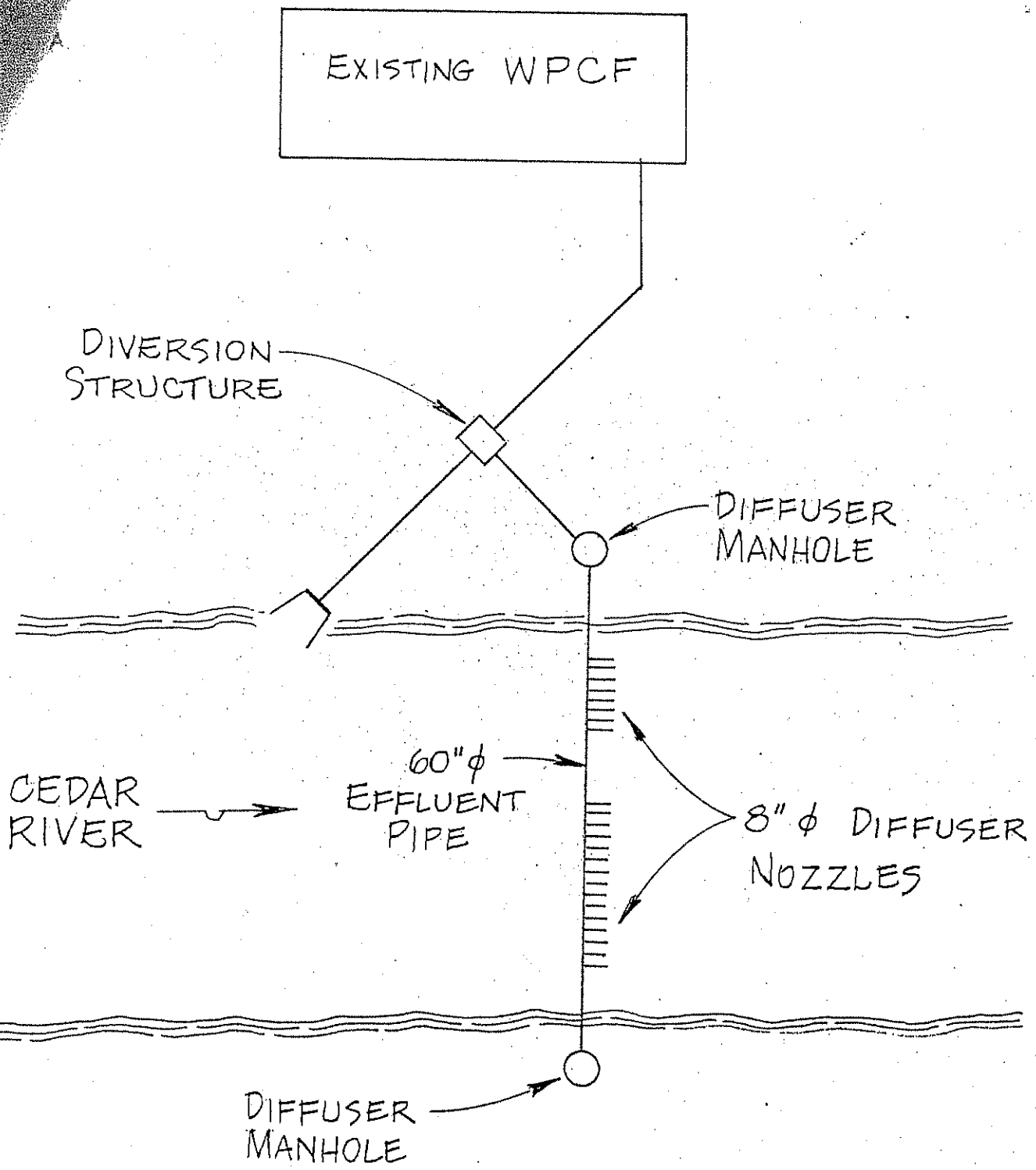
PROJECT IDENTITY

Cedar River Diffuser and Utility Crossing

WAWM USE

PROJECT NO.

PERMIT NO.



WAWM form 28-H1 (Jul 1, 83) (Replaces DEQ Form WQ 133-H1, which may be used)